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The Potency of Synthetic Medium Tuberculin for Use in the Double Intradermal Test in Cattle*

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Although ammonium sulphate precipitated synthetic medium tuberculin has been in general use for the double intradermal tuberculin testing of cattle in this country for some years, relatively little work on the potency at which it should be employed has been published. Buxton and Glover (1933) were content with a potency about equivalent to the standard adopted by the Institute of Animal Pathology, Cambridge, for Old Tuberculin for use in this test on the basis of numerous experiments and a wide field experience (Buxton, 1925).

It must be appreciated that synthetic medium tuberculin may be prepared to any potency within reasonable limits. Glover (1933) using tuberculins varying from "standard" to ten times "standard" potency observed that the reactions in tuberculous cattle were much increased by the use of the more potent materials. The swellings in clean cattle, however, became less easily identified as negative as the potency rose. There was an increasing tendency towards diffuseness which, while the swellings were clearly non-specific, simulated that seen in reacting cattle. He concluded that there was a limit above which the potency could not be raised because, thereafter, the occurrence of pseudo-positive reactions would become a serious disadvantage.

Despite this declared disadvantage of high potency tuberculin one must agree with Buxton (1928), "It is obvious that any attempt to improve our methods for the detection of tuberculosis in cattle is useless unless we can be quite certain that the tuberculin employed for the purpose is sufficiently potent." This statement is even more acceptable now when the eradication of tuberculosis is proceeding at a rate many-fold that of ten years ago. To-day, leaving (through the use of a low potency tuberculin) an infective animal in a herd supposedly clean or from which the disease is being eradicated may well have disastrous consequences.

Since July, 1937, the writers have had opportunity to make some observations on the potency of synthetic medium tuberculin for use in the double intradermal test. Although they have been unable to carry their work to a conclusive stage, it well illustrates the need for further detailed observations to determine more accurately the potency at which this type of tuberculin should be used for this purpose.

Tuberculins Employed.

Synthetic medium tuberculin obtained from the Royal Veterinary College (hereafter termed C.T.), some kindly supplied by Professor Buxton, has been used extensively, for it is the tuberculin almost exclusively employed in this country at present. Judged by the guinea-pig intracutaneous test, the potency of the various batches employed has varied little, being approximately one quarter that of International Standard (I.S.T.) in each case.

Department of Agriculture (U.S.A.) Mammalian Tuberculin has been employed to a limited extent. A small supply was kindly presented to Dr. O'Brien by Dr. J. R. Mohler. This is a heat concentrated synthetic medium tuberculin which, according to guinea-pig intracutaneous tests, is of a potency equal to one half of I.S.T.

Synthetic medium tuberculin prepared in these laboratories at Langley Court after the manner detailed by Buxton and Glover (1933), hereafter termed L.C. or identified simply by the number of the particular batch, has been used in all our observations. Its preparation differs from that of C.T. mainly in the strains of the tubercle bacillus used. T.100 (human) and B.C.G. were the two strains originally employed in the production of C.T., whereas cultures of H.37 (human) and B.4 (bovine) have been used at Langley Court. Relative to International Standard the batches specifically mentioned in this article, namely 2,138, 2,111

*This paper formed the basis of addresses given to the Western Counties Division, N.V.M.A., at Taunton, on October 26th, 1938, and the South-Eastern Division, N.V.M.A., at Tunbridge Wells, on November 18th, 1938.

and 2,106, had a potency, as originally prepared, of twice Standard, Standard and Standard respectively.

It is not contended here that the relative potency of tuberculins as judged by intracutaneous guinea-pig tests is the same as when the tuberculins are compared by cattle testing.

Technique.

Throughout this work the double intradermal test, applied on the side of the neck, has been used and every effort has been made to keep the technique constant at a high level. When two or more tuberculins were used simultaneously, sites separated by at least four inches were selected and retests were carried out on the side opposite to that last used. Separate syringes of identical type have been employed for each tuberculin.

Preliminary Observations with Langley Court Tuberculin (L.C.)

One of us (R.F.M.) had had quite an extensive experience of testing with C.T. before this work was commenced. In the first preliminary tests each batch of L.C.—used individually and simultaneously—regularly gave particularly large reactions on known infected cattle, while the frequency of the necessity to reinject was surprisingly low. On cows believed to be clean, a "Tuberculin Tested" herd with a good history, it was found that these tuberculins occasionally gave rise to a small spongy swelling which might appear very slightly diffuse. To one accustomed to the firm pea of the typical negative swelling to C.T. they were somewhat confusing. None could have been read as positive but some could, with considerable justification, have been classified as doubtful.

Since the L.C. tuberculins were obviously of very high potency, the possibility of eliminating these unsatisfactory negative swellings by dilution was investigated. Using the laboratory herd, which had been free from tuberculosis for many years, eight cows were simultaneously tested with two batches of L.C., 2,138 and 2,111, each tuberculin being used, neat, diluted 1 in 5 and diluted 1 in 10. Two of the eight animals gave a spongy bean-like swelling with the neat tuberculins. To the diluted material the swellings were entirely satisfactory, there being little evidence of its presence at the site of the injections or just a tiny pea somewhat softer than that usually seen with C.T. This result was confirmed by similarly testing 20 cows in a "Tuberculin Tested" herd.

Thereafter 20 known reactors were tested with the L.C. tuberculin 2,138, neat, diluted 1 in 5 and diluted 1 in 10, and with C.T. (batch 47·6). It was evident that dilution to 1 in 5 did not materially reduce the quality of the reactions to 2,138. At that dilution the reactions were distinctly superior to those to C.T. Dilution 1 in 10 did reduce the size and quality of the positive swellings but they were then approximately equal to those to C.T. These findings were confirmed in the similar testing of a group of reactors in another herd. Since the potency of 2,138 diluted 1 in 5 appeared to exceed markedly that of C.T., further tests on known clean cattle were carried out with a view to determining whether, when so diluted, 2,138 still showed a tendency to cause small spongy swellings in clean cattle. A herd from which the disease had been eradicated some years previously and which is now Attested was placed at our disposal. Each of the 63 animals (60 cows and three bulls; the young stock being kept on an adjoining farm) were simultaneously tested with 2,138 diluted 1 in 5 and with C.T. All but five gave quite characteristic negative swellings; a small firm pea to C.T. and a tiny swelling or a very small softer pea to L.C. In five animals the measurements were larger than normal, but the character of the swelling clearly negative. Three of these larger negative swellings arose at the site of injection of L.C. and two at the C.T. site. Similar comparisons were made in other "clean" herds and a review of the work at this stage did suggest that dilution removed from L.C. any tendency to produce unsatisfactory swellings in clean catle.

On this evidence it was decided to use the L.C. tuberculins in further comparative work at a potency, as judged by the guinea-pig intracutaneous test, equal to two-fifths of International Standard Tuberculin. Batch 2,138 was, therefore, diluted 1 in 5, and batches 2,111 and 2,106 diluted 1 in 2½ for all further cattle testing and became known as 2,138/5, 2,111/2½ and 2,106/2½ respectively. A number of further comparative tests using one or more of these tuberculins simultaneously with C.T. and, occasionally, with the U.S.A. batch No. 650 were made on cattle of known history. One of these observations may be detailed to illustrate the typical result. Seven "clean" and seven "infected" cows were simultaneously tested with the U.S.A. tuberculin, with C.T. (batch No. 44.3), with 2,138/5, with 2,106/2½ and with 2,111/2½. The seven clean cows were members of a "Tuberculin Tested" herd in which an occasional reactor was still being encountered at successive tests; each had passed tests, using C.T. and 2,138/5, one month previously. The seven infected cows had been removed as reactors (testing with L.C. tuberculin) from this herd and were members of an infected herd kept on a separate farm. Of these, five were reactors of some standing (they had given their first positive reaction at least two years previously), whereas one, "Sunshine," was doubtful six months previously and

gave her first positive reaction on retest after one month. All were in good milking condition. A cow giving tuberculous milk had recently been removed from this herd and the remaining animals were then clinically examined by a county veterinary officer who regarded none as clinically affected with tuberculosis within the meaning of the Tuberculosis Order of 1925. The results of these tests are set out in Tables I and II.

With one exception the clean cows gave clear cut negative swellings to each of the five tuberculins. The character of the swellings to the U.S.A. tuberculin rather resembled that to the L.C. tuberculins, there being only a little trace of the tuberculin in the skin or a small pea less firm than that to C.T. The exception was the cow "Lily" in which the swelling to each tuberculin was somewhat larger than in the characteristic negative reactions. There was no evidence of diffusion with C.T., with 2,138/5 and with 2,111/2½. With the U.S.A. tuberculin, however, there was just a little diffusion and the reaction was read as positive. Since there appeared to be a trace of diffusion with 2,106/2½, the reaction was regarded as doubtful.

In the reactor group definite diffusion to the injection of C.T. was present at the forty-eighth hour in only one animal and each of the others was reinjected then. With each of the other tuberculins, diffusion was present in each animal at the forty-eighth hour and reinjection was unnecessary, the reactions being

TABLE I

The simultaneous testing with five tuberculins of seven "clean" cows

Cow.	Tuberculin.	Pre.	48 hours.	72 hours.	Reaction.
Lily	U.S.A.	7	11 Tr.	12 Sl.	Positive
	C.T.	7	8	10 C.	Negative
	2138/5	7	7	9 C.	,,
	2106/2½	7	9	11 Tr.	Doubtful
	2111/2½	7	8	9 C.	Negative
Summer	U.S.A.	5	5	5 C.	Negative
	C.T.	5	5	7 C.	,,
	2138/5	5	5	6 C.	,,
	2106/2½	6	6	7 C.	,,
	2111/2½	5	6	6 C.	,,
Dot	U.S.A.	7	8	8 C.	Negative
	C.T.	7	8	9 C.	,,
	2138/5	6	7	7 C.	,,
	2106/2½	6	6	7 C.	,,
	2111/2½	6	6	7 C.	,,
Felicity	U.S.A.	6	7	8 C.	Negative
	C.T.	6	7	8 C.	,,
	2138/5	6	8	7 C.	,,
	2106/2½	6	7	8 C.	,,
	2111/2½	6	6	7 C.	,,
Annie	U.S.A.	6	7	8 C.	Negative
	C.T.	6	7	8 C.	,,
	2138/5	6	6	7 C.	,,
	2106/2½	6	6	8 C.	,,
	2111/2½	6	6	8 C.	,,
Rosie	U.S.A.	6	7	8 C.	Negative
	C.T.	6	7	9 C.	,,
	2138/5	5	6	6 C.	,,
	2106/2½	6	8	8 C.	,,
	2111/2½	7	7	8 C.	,,
Ursula	U.S.A.	4	5	6 C.	Negative
	C.T.	4	6	7 C.	,,
	2138/5	4	5	6 C.	,,
	2106/2½	4	6	7 C.	,,
	2111/2½	4	5	5 C.	,,

Tr. = Trace of diffusion. Sl. = Slight diffusion.
C. = Circumscribed.

TABLE II

The simultaneous testing with five tuberculins of seven known reactors

Cow.	Tuberculin.	Pre.	48 hours.	72 hours.	Reaction.
Evelyn	U.S.A.	5	16 D.*	26 D.	Positive
	C.T.	5	6	9 Tr.	Doubtful
	2138/5	5	12 D.*	13 D.	Positive
	2106/2½	5	16 D.*	22 D.	,,
	2111/2½	5	19 D.*	20 D.	,,
Alice	U.S.A.	5	14 D.*	14 D.	Positive
	C.T.	5	9	10 C.	Negative
	2138/5	6	13 D.*	14 D.	Positive
	2106/2½	7	16 D.*	14 D.	,,
	2111/2½	7	14 D.*	12 D.	,,
Amelia	U.S.A.	6	12 D.*	14 D.	Positive
	C.T.	6	9	10 Sl.	,,
	2138/5	6	11 Sl.	13 D.	,,
	2106/2½	5	13 D.*	14 D.	,,
	2111/2½	5	11 Sl.	12 D.	,,
Angela	U.S.A.	6	13 D.*	14 D.	Positive
	C.T.	6	9	9 C.	Negative
	2138/5	5	10 Sl.*	10 Sl.	Positive
	2106/2½	6	12 D.*	12 D.	,,
	2111/2½	6	11 Sl.*	11 Sl.	,,
Barbara	U.S.A.	6	18 D.*	20 D.	Positive
	C.T.	6	9	13 D.	,,
	2138/5	7	16 D.*	16 D.	,,
	2106/2½	6	20 D.*	19 D.	,,
	2111/2½	7	15 D.*	17 D.	,,
Sunshine	U.S.A.	7	30 D.*	33 D.	Positive
	C.T.	7	12 D.*	16 D.	,,
	2138/5	6	30 D.*	28 D.	,,
	2106/2½	7	28 D.*	28 D.	,,
	2111/2½	6	24 D.*	25 D.	,,
Olive	U.S.A.	6	14 D.*	14 D.	Positive
	C.T.	5	7	9 Sl.	,,
	2138/5	5	11 Sl.*	11 Sl.	,,
	2106/2½	5	13 D.*	12 D.	,,
	2111/2½	6	13 D.*	12 D.	,,

D. = Diffusion. Tr. = Trace of diffusion.
Sl. = Slight diffusion. C. = Circumscribed.
* = No second injection.

characteristically positive. The U.S.A. tuberculin generally gave the largest and most diffuse reaction, 2,106/2½ gave slightly less swelling and diffusion, and was closely followed by 2,138/5 and 2,111/2½. Even after reinjection with C.T. two of the cows were quite negative at the seventy-second hour, and in one the reaction could only be classified as doubtful. The figures in Table II hardly do justice to the differences observed, for the variation in the degree of diffusion was much more marked than they suggest. It is perhaps interesting to note that the animal which gave the best reaction to each tuberculin, "Sunshine," was the cow which had recently (five months previously) given its first positive reaction. This observation suggests cows of high sensitivity, *e.g.*, "Sunshine" and "Barbara," give good reactions to C.T., but that those of lower sensitivity give only comparatively poor reactions, even negative swellings, to that tuberculin.

Three other simultaneous tests with groups of cattle of known history gave results quite comparable with those set out in Tables I and II.

A review of the preliminary work illustrated very clearly the need for further comparative testing to define more clearly the relationship between L.C. and C.T. It was already evident that the diluted L.C. tuberculin, as judged by the numerous tests on infected cattle, was of a potency perhaps even twice that of C.T. It did seem, as is well illustrated in Table II, that this higher potency was necessary if the double intradermal test was to be relied upon to pick out at least the great majority of infected cattle. The possibility that the more potent L.C. tuberculins might give rise to pseudo-positive reactions, as might be suggested by the test of "Lily" (Table II), had also to be kept in mind.

Simultaneous Testing with C.T. and with L.C. in the Field

To obtain a wide experience of the comparative value of the two tuberculins and a proper estimation of the level of disagreement, already apparent, it was decided to extend the simultaneous testing to unselected herds in various parts of the country. It was difficult to find suitable owners willing to permit such "experimental" testing and we are particularly indebted to the practitioners and county veterinary officers who have undertaken this work at our suggestion. Since it appeared quite representative of the three L.C. batches as regards potency, judged on cattle testing, we chose 2,138/5 for these field observations. Space does not permit the detailing of the findings in every herd test. Those of the first eleven consecutive herds on which the tuberculins were compared are characteristic and will be described.

Herd I.

This herd had been tested on two previous occasions; the last some 15 months earlier. The cows over four years old, all but two of which had reacted to that test, were kept in a separate shippon with separate pastures. Three animals of this group had been removed under the Tuberculosis Order during the preceding year. All had been clinically examined on behalf of the County Council just prior to this simultaneous test of the 65 cows and 23 "yearlings" whose history was known. The tuberculins C.T. (Batch 43.3) and 2,138/5 were used and the results may be summarised as follows (D = doubtful):—

	Tested	*Reacted C.T.*	*Reacted L.C.*
Cows over four years, all except two were known reactors	33	26+1 D.	32
Cows three to four years, all passed previously	32	5+1 D.	11+1 D.
Yearlings, all passed previously	17	3	3
Yearlings, all reacted previously	6	5+1 D.	6
Total =	88	39+3 D.	52+1 D.

Among the 88 cattle there were 14 (15·9 per cent.) disagreements; ten C.T. neg./L.C. pos., three C.T. doubt./L.C. pos., one C.T. neg./L.C. doubt.

Although it is appreciated that measurements are not the criteria on which individual tests should be read, the average measurements for a group of cattle illustrate well any differences observed in simultaneous testing. Yet, as between these two tuberculins they do not emphasise them, for the positive reactions to L.C. were more markedly superior in diffuse oedema than the figures quoted below suggest.

Average Measurements for the 65 Cows

		Pre.	*48hr.*	*72hr.*	
31 Positive agreements	C.T.	6·0	12·3	16·5	(15*)
	L.C.	6·3	18·1	23·2	(27*)
21 Negative agreements	C.T.	6·1	7·2	8·1	
	L.C.	6·0	6·5	7·8	
10 Disagreements C.T. neg./L.C. pos.	C.T.	5·8	7·1	9·0	
	L.C.	5·7	9·3	13·2	(2*)
2 Disagreements C.T. doubt./L.C. pos.	C.T.	6·5	8·5	11·5	
	L.C.	6·0	10·0	14·0	
1 Disagreement C.T. neg./L.C. doubt.	C.T.	6·0	6·0	7·0	
	L.C.	6·0	7·0	9·0	

*No second injection.

The reactions of the 31 old cows, which had reacted to C.T. 15 months previously and had since been kept, with two negative cows (one now positive to both tuberculins), as an infected herd, are of especial interest. All reached to L.C., only six requiring a second injection. Only 25 reacted (one was doubtful) to C.T. and 18 of them required a second injection. There were, therefore, five of these "known reactors" which, although they reacted to L.C., gave negative swellings to C.T.

The main features of this comparative test may be briefly set out as: (1) Where there was negative agreement the character of the swelling at the L.C. site, although slightly different from that of C.T., was good; (2) the character, as also the size, of the positive reactions to L.C. was regularly better, in the majority of cattle markedly so, than that to C.T.; (3) between the two tuberculins there was a diagreement of 15·9 per cent.; (4) Reinjection with L.C. was rarely necessary in animals reacting to both tuberculins; only four were reinjected whereas 16 had to be reinjected with C.T.; (5) in individual reactors there was a close parallel in the relative degree of swelling and diffusion caused by the two tuberculins, it being above or below the average for L.C. where it was so for C.T.

The animals in which disagreement was observed very generally gave less diffusion than the average in reactors to L.C. It therefore seemed that C.T. had failed to detect some affected cattle of low sensitivity. Since such a proportion of the cows which had previously reacted to it now passed to C.T., it could not be said that this was due to very recent infection. It seemed, rather, to relate to the existing state of the disease in the individual animal and to occur quite readily among cows which had been infected for many months.

HERD II.

This herd had been tested at intervals over a period of two years but, despite the removal of reactors, an occasional new reactor had been found at succeeding tests. It is known that Johne's disease is present in the herd. The cows, bulls and in-calf heifers, 153 animals, were simultaneously tested with C.T. (Batch 44.5) and with 2,138/5. Professor Dalling was present when the results were read as:—

Cattle reacting to both tuberculins	7
Cattle negative to both tuberculins	134
Cattle negative to C.T. but positive to L.C.	9
Cattle negative to C.T. but doubtful to L.C.	2
Cattle doubtful to C.T. but positive to L.C.	1

The average measurements for these five groups were:—

		Pre.	48*hr.*	72*hr.*	
7 Positive agreements	C.T.	6·3	10·5	12·1	(2*)
	L.C.	6·4	11·7	14·1	(2*)
134 Negative agreements	C.T.	6·5	7·7	8·5	
	L.C.	6·1	6·5	7·3	
9 Disagreements					
C.T. neg./L.C. pos.	C.T.	6·6	7·9	9·2	
	L.C.	6·2	10·5	13·7	
2 Disagreements					
C.T. neg./L.C. doubt.	C.T.	7·0	8·5	10·0	
	L.C.	7·0	9·5	11·5	
1 Disagreement					
C.T. doubt./L.C. pos.	C.T.	7·0	8·0	11·0	
	L.C.	5·0	11·0	12·0	

*No second injection.

Where there was positive agreement, the character of the swelling to L.C. was regularly better, but the difference was not so marked as in the previous herd. This may have been because these animals were *very* recently infected. Among the cattle negative to both tuberculins the slightly different character of the swellings to the two tuberculins was again evident, but the proportion of cows in which the L.C. site could only be found by careful palpation at the seventy-second hour was considerable.

HERD III.

This herd had been tested on a previous occasion but as there had been some mixing of the cows since then the results on that occasion can be ignored. It consisted of 29 cows, two bulls and three young calves and all were simultaneously tested with C.T. (Batch 44.5) and with 2138/5 (L.C.) with the following results:—

Cattle reacting to both tuberculins	15
Cattle negative to both tuberculins	17
Cattle negative to C.T. but reacting to L.C.	1
Cattle doubtful to both tuberculins	1

The average measurements for these four groups were:—

		Pre.	48*hr.*	72*hr.*	
15 Positive agreements	C.T.	6·2	11·5	16·0	(4*)
	L.C.	6·0	20·6	24·8	(11*)
17 Negative agreements	C.T.	5·9	7·5	8·4	
	L.C.	5·8	6·5	6·8	
1 Disagreement					
C.T. neg./L.C. pos.	C.T.	7·0	9·0	12·0	
	L.C.	7·0	10·0	13·0	
1 Agreement doubtful	C.T.	7·0	9·0	11·0	
	L.C.	7·0	10·0	12·0	

*No second injection.

In this herd there was close agreement between the two tuberculins although the quality of the swelling, negative as well as positive, was regularly distinctly superior at the L.C. site and it was was much less frequently necessary to reinject reactors with that tuberculin. In the cow in which there was disagreement the character of the swellings was markedly different.

HERD IV.

Since a test almost a year previously some attempt at isolation of the reactors had been made, but this had evidently been only a partial success and the bull, 27 cows, eight two-year-olds and six yearlings (42 cattle) submitted to the comparative test may well be regarded as a single herd. The batch number of the C.T. used was 44.5. The following results were obtained:—

Cattle reacting to both tuberculins	23
Cattle negative to both tuberculins	14
Cattle negative to C.T. but reacting to L.C.	2
Cattle doubtful to C.T. reacting to L.C. ...	1
Cattle negative to C.T. doubtful to L.C. ...	1
Cattle doubtful to C.T. negative to L.C. ...	1

In this herd there was close agreement between the tests with the two tuberculins but, again, the superiority of the reactions to L.C. was marked. The writers here encountered their first instance of C.T. tending to give a reaction where L.C. was negative. The C.T. swelling showed a considerable firm "core" but there was just a trace of oedema at the lower edge. All the six "yearlings" reacted with each tuberculin to such an extent that in no case was a second injection necessary. The average measurements in this group of cattle were:—

Six Yearlings Reacting to Both Tuberculins

	Pre.	48*hr.*	72*hr.*	
C.T.	6·5	14·6	15·1	(6*)
L.C.	6·0	26·0	28·1	(6*)

*No second injection.

HERD V.

This was a herd of 75 commercial dairy cows which had not previously been tested. Mr. S. V. Golledge, M.R.C.V.S., of Trowbridge, then County

Veterinary Officer for Wiltshire, obtained the owner's permission to test these cattle simultaneously with the two tuberculins. He purchased C.T. through the usual channels. The entire test was carried through by this officer who was good enough to supply us with full details which are summarised below:—

Cows reacting to both tuberculins	38
Cows negative to both tuberculins	21
Cows negative to C.T. but reacting to L.C.	12
Cows negative to C.T. but doubtful to L.C.	4

The following were the average measurements in the four groups of cows:—

		Pre.	48*hr.*	72*hr.*	
38 Positive agreements	C.T.	6·6	9·5	11·8	(7*)
	L.C.	6·6	20·5	25·1	(28*)
21 Negative agreements	C.T.	6·6	8·4	9·2	
	L.C.	6·6	8·0	8·6	
12 Disagreements					
C.T. neg./L.C. pos.	C.T.	6·2	7·5	8·0	
	L.C.	6·2	12·0	15·3	(4*)
4 Disagreements					
C.T. neg./L.C. doubt.	C.T.	6·8	8·0	8·3	
	L.C.	6·9	8·7	10·3	

*No second injection.

This independent observer commented on the good character of the negative and the positive reactions to L.C. and regarded the tuberculin as distinctly superior to C.T. That in his hands there was a 22 per cent. disagreement between the tuberculins generally confirmed previous findings. Furthermore, from the figures quoted above it is seen that the great majority of these disagreements were particularly clear cut.

Herd VI.

This small commercial untested herd of 18 animals was tested by Mr. Golledge at a later date with the following results:—

Cows reacting to both tuberculins	4
Cows negative to both tuberculins	13
Cows doubtful to C.T. but reacting to L.C.	1

Mr. Golledge again expressed satisfaction with the character of the swellings to L.C. where there was negative agreement. In the four reactors the character of the swelling to L.C. tuberculin was markedly superior and in three instances it was not reinjected.

Herd VII.

This herd of 56 cows had not been previously tested and the entire test was conducted by Dr. L. Jordan, then County Veterinary Officer for West Sussex. He supplied the detailed results summarised below:—

Cows reacting to both tuberculins	28
Cows negative to both tuberculins	4
Cows negative to C.T. but positive to L.C.	23
Cows doubtful to C.T. but positive to L.C.	1

The average measurements for these four groups of cows were:—

		Pre.	48*hr.*	72*hr.*	
28 Positive agreements	C.T.	6·7	10·4	13·8	(4*)
	L.C.	6·9	16·6	23·4	(27*)
4 Negative agreements	C.T.	6·0	6·7	7·7	
	L.C.	6·0	6·7	7·5	
23 Disagreements					
C.T. neg./L.C. pos.	C.T.	6·0	7·5	9·1	
	L.C.	6·2	11·4	16·2	(10*)
1 Disagreement					
C.T. doubt./L.C. pos.	C.T.	6·0	8·0	9·0	
	L.C.	7·0	12·0	19·0	

*No second injection.

It is obvious from the figures quoted above that: (1) In the cows reacting to both tuberculins the reactions to L.C. were much better. In fact, Dr. Jordan suggested that the swellings to L.C. were excessively large in occasional cows and regarded this as a disadvantage; (2) re-injection with L.C. was necessary in only 15 of the 52 cows which reacted to it; (3) quite clear-cut reactions to L.C. were obtained in the great majority of the cows which were negative to C.T.; (4) the level of disagreement was 43 per cent.

Herd VIII.

This was a first test of a herd of 33 cows and one bull, carried out by Dr. Jordan, but in this case one of us (R. F. M.) was present at the reading of the tests on the final day when the following results were noted:—

Cows reacting to both tuberculins	16
Cows and bull negative to both tuberculins	8
Cows negative to C.T. but positive to L.C.	9
Cows doubtful to C.T. but positive to L.C.	1

The average measurements for these four groups of cows were:—

		Pre.	48*hr.*	72*hr.*	
16 Positive agreements	C.T.	7·0	10·4	14·8	(3*)
	L.C.	6·4	16·0	21·4	(12*)
8 Negative agreements	C.T.	7·5	8·7	10·2	
	L.C.	7·2	9·4	12·1	
9 Disagreements					
C.T. neg./L.C. pos.	C.T.	6·3	7·9	10·1	
	L.C.	6·3	12·8	15·4	(6*)
1 Disagreement					
C.T. doubt./L.C. pos.	C.T.	8·0	9·0	10·0	
	L.C.	6·0	14·0	18·0	(*)

*No second injection.

Comments similar to those relating to Herd VII may be made in this case except that the disagreement rate was 29 per cent. It must be noted, however, that the average measurement for L.C. tuberculin in the negative agreements was greater than for C.T. This was the first instance in which that was observed.

Herd IX.

This herd was tested by Dr. Jordan on the same days as Herd VIII and under the same conditions. The 40 cows were part of the main herd which had been tested two months previously, these animals passing to C.T. on that occasion. It had been noted then that the character of the swellings was not good in that a curious leathery thickening of the skin was present, along with slight oedema, in the reacting cows. This type of swelling was again observed. It did not occur more frequently or to a greater extent with either tuberculin but, in some cases, it did interfere with easy interpretation of the tests which gave the following results:—

Cows reacting to both tuberculins	16
Cows negative to both tuberculins	6
Cows negative to C.T. but reacting to L.C.	15
Cows doubtful to C.T. but reacting to L.C.	1
Cows doubtful to both tuberculins	2

The average measurements for these five groups of cows were:—

		Pre.	48*hr.*	72*hr.*	
16 Positive agreements	C.T.	8·3	11·0	14·3	(4*)
	L.C.	7·9	14·0	17·1	(12*)
6 Negative agreements	C.T.	8·2	9·2	10·0	
	L.C.	8·0	9·3	11·3	
15 Disagreements					
C.T. neg./L.C. pos.	C.T.	8·0	9·2	10·1	
	L.C.	8·3	12·1	14·5	(4*)

		Pre.	*48hr.*	*72hr.*
1 Disagreement				
C.T. doubt./L.C. pos.	C.T.	7·0	8·0	11·0
	L.C.	7·0	11·0	16·0
2 Doubtful agreements	C.T.	8·5	10·5	12·0
	L.C.	7·5	11·0	13·0

*No second injection.

A particularly large proportion of these cows, since all had passed using C.T. two months previously, reacted to both tuberculins or to L.C. only. The level of disagreement was 40 per cent. Where there was positive agreement L.C. regularly gave the larger and more characteristic swelling and reinjection was rarely necessary. The average measurement for L.C. in the cows giving a negative agreement was a little greater than that to C.T.

HERD X.

This herd was tested by Mr. A. H. Andrew, M.R.C.V.S., of Ware, who obtained his supply of C.T. from the Royal Veterinary College and 2,138/5 from these laboratories. All the 21 cows had previously passed with C.T. on two occasions and, since the herd was self-contained, the cows could well be regarded as clean.

Each of the animals gave a characteristic negative swelling to each tuberculin, the average measurements being:—

		Pre.	*48hr.*	*72hr.*
21 Negative agreements	C.T.	6·2	7·5	8·2
	L.C.	5·9	7·1	7·8

The practitioner reported that the swelling at the L.C. site was slightly smaller but that, had one not been aware that two different tuberculins were in use, no comment would have been made. It is most interesting to observe entire agreements between the two tuberculins in this herd which one had reason to regard as clean. This lends further support to the contention that L.C. gives quite satisfactory swellings in clean cows.

HERD XI.

We are obliged to Mr. J. R. Rider, M.R.C.V.S., of Darlington, for carrying through this comparative test and reporting in detail. The herd was first tested in 1933 when the proportion of reactors was small. Since the disposal of the reactors to that test, the herd has been free from reactors and maintained by the isolation and retesting of purchased animals, chiefly young calves. Two of the latter have been found infected on purchase, the last a six-weeks-old calf bought in August, 1937. Mr. Rider purchased C.T. (Batch 44.5) and we supplied 2,138/5. The details of the results were as follows:—

Cows reacting to both tuberculins	Nil
Cows negative to both tuberculins	16
Cows negative to C.T. but reacting to L.C.	1
Cows doubtful to both tuberculins	1

Of the 16 cows negative to both tuberculins, one gave a bean-like swelling to L.C. Since it was perfectly circumscribed the reaction was read as negative. Otherwise, the negative swelling to L.C. was in some "hardly palpable," in others "less than C.T.," while in a few it was "slightly larger and less firm" than the characteristic negative pea of C.T.

TABLE III

Summary of Results of Field Tests with C.T. and L.C. simultaneously

Herd.	Cattle tested.	Positive agreements.	Negative agreements.	Doubtful agreements.	C.T. Neg. L.C. Pos.	C.T. Neg. L.C. Doubt.	C.T. Doubt. L.C. Pos.	C.T. Doubt. L.C. Neg.	Disagreement. Per cent.
I.	88	39	35	—	10	1	3	—	15·9
II.	153	7	134	—	9	2	1	—	7·8
III.	34	15	17	1	1	—	—	—	2·9
IV.	42	23	14	—	2	1	1	1	11·9
V.	75	38	21	—	12	4	—	—	21·3
VI.	18	4	13	—	—	—	1	—	5·5
VII.	56	28	4	—	23	—	1	—	43
VIII.	34	16	8	—	9	—	1	—	29
IX.	40	16	6	2	15	—	1	—	40
X.	21	—	21	—	—	—	—	—	Nil
XI.	18	—	16	1	1	—	—	—	5·5
Total	579	186	289	4	82	8	9	1	17·3
Percentage of Total		32·1	49·9	0·7	14·2	1·4	1·5	0·2	

Since Herd XI was tested other practitioners have reported findings similar to those summarised in Table III in other herds or groups of animals. There has been general agreement that L.C., used in previously untested herds, picks out as reactors animals in which C.T. gives a negative swelling.* The incidence of this happening has varied from 5 per cent. to 43 per cent. In the few self-contained herds with a long history of freedom from reactors in which the two tuberculins have been used all the animals have passed to both tuberculins. The difference in the character of the negative swelling to L.C. has regularly been noted, but has been regarded as satisfactory except in one instance. Here the swellings were large and soft but not oedematous in a small group of thick skinned cows which had previously given

unsatisfactory swellings to C.T. The practitioner in reporting this result mentioned that he had given an ample dose of the tuberculin. On further enquiry he said he was satisfied that he gave more than 0·1 c.c. at each injection; he thought by so doing that he would more readily procure a definite result. Exceeding the dose *may* not matter when one is using a tuberculin of low potency but it is bad practice to overdose, especially with a really potent tuberculin.

More recently it has been possible to retest with the two tuberculins, on one or more occasions, herds from which tuberculosis was being eradicated. The experience of Mr. J. B. White, of Salisbury, in this connection has been particularly extensive. He reports that in several large herds under his control he has in the past failed to eradicate the disease, despite repeated testing at intervals of six months. The history and results in one of these herds well illustrates the general finding where eradication based on simultaneous testing with the two tuberculins has been practised. The owner had five separate farms carrying a stock of 530 cattle. He had held a Tuberculin Tested Licence for approximately five years but at successive tests had a varying number of reactors. At the first simultaneous test 44 animals reacted to L.C. but only 24 of them were positive to C.T.; each farm having some reactors. On retest three months later eight reactors were detected; one of the farms having a clean test. The third test revealed one reactor on each of two farms, the remaining three farms being clean. Since then one farm has passed the official test for attestation. After each simultaneous test all reactors to L.C. tuberculin have been discarded from the herd and Mr. White is satisfied that the use of tuberculin at the L.C. potency has very materially hastened the eradication of tuberculosis from this herd. He has now had a wide experience of testing clean cattle with L.C. and believes it unlikely to cause any material proportion of pseudo-reactions.

This field use of the two tuberculins simultaneously has confirmed the view that the diluted L.C. tuberculin is of distinctly greater potency than is C.T. as judged by cattle tests. It seems evident that through this higher potency it picks out as reactors many cattle negative to C.T. The number varies with the state of the disease in the herd from 43 per cent. in the previously untested cows to none in herds believed to be clean. The great majority of the cattle tested simultaneously with the two tuberculins have been mature cows and it has been among this class that disagreement has usually been observed. In calves and yearling cattle there has been close agreement but the quality of the swelling, both negative and positive, has regularly been favourable to L.C. This field work has not suggested that, through its higher potency, L.C. tuberculin has any real increased tendency to cause pseudo-reactions in clean animals.

Retesting Cattle Which Had Given Disagreement Reactions

As one means of determining which tuberculin had given the correct, or more correct, result, cattle which had shown disagreement reactions have been retested where this was possible. Unfortunately most of the herds have been preparing for Attestation and the owners have disposed of all reactors to L.C. tuberculin forthwith, even though negative to C.T.

The detailed results in retesting the discrepant animals in two herds illustrate the general findings.

Herd I.

Of the 14 cattle which gave contrasting reactions to the original test (page 1762), 12 were available for retest two months later. The exceptions were a cow and a yearling, each of which gave the disagreement C.T. doubtful/L.C. positive. These 12 cows were retested using U.S.A. 650, C.T., 2,138/5, 2,106/2½ and 2,111/2½. On this occasion Professor Dalling was with us when the results were read.

On retest of the 10 cows which had given C.T. negative/L.C. positive disagreements the results were:—

	Reacted	*Passed*	*Doubtful*
U.S.A. 650 ...	10 (3 N.S.I.)	Nil	Nil
C.T.	3	7	Nil
2,138/5 ...	8 (1 N.S.I.)	1	1
2,106/2½ ...	10 (2 N.S.I.)	Nil	Nil
2,111/2½ ...	9 (2 N.S.I.)	Nil	1

The cow previously doubtful/positive now reacted to all tuberculins and that previously negative/doubtful was still negative to C.T. but clearly positive to the other four tuberculins.

On this occasion one or more plus signs were awarded the reactions to each tuberculin on each of the 12 cows, basing the decision purely on the positive character of the swelling. When the number of signs awarded each tuberculin on all 12 cows were added after completion of the test the totals were: U.S.A., 37; C.T., 5; 2,138/5, 18; 2,106/2½, 26; 2,111/2½, 23. This method of valuation conveys a clear picture of the differences observed. If the contention that all these cows were infected animals be accepted, it may be concluded that C.T. failed to give a positive reaction in 70 per cent., 2,138/5 in 17 per cent. and 2,111/2½ in 8 per cent. of animals whose sensitivity was certainly low but yet sufficient to permit them to react to U.S.A. and 2,106/2½.

Herd V.

Mr. S. V. Golledge was able to retest with C.T. and 2,138/5, two months after the original test, the 16 cows which had given discrepant results. One of us (R. F. M.) was present when the retests were read. During the interval between the tests the cows had been "isolated" but it is

TABLE IV

Herd No. V. Results of Original Test and of Retest after 2 months.

Cow.	Tuberculin.	Original Test.				Retest.			
		Pre.	48 hours.	72 hours.	Reaction.	Pre.	48 hours.	72 hours.	Reaction.
23	C.T.	6	8	8	Negative	6	6½	8½	Negative
	L.C.	6	7	10 Sl.	Positive	6	9	12 D.	Positive
28	C.T.	7	8	8	Negative	6	8 Tr.	11 D.	Positive
	L.C.	6	14 D.*	17 D.	Positive	6	14 D.*	14 D.	,,
110	C.T.	6	8	8	Negative	5	7½	10 VS.	Doubtful
	L.C.	6	10 D.	14 D.	Positive	5	10½ D.	17 D.	Positive
94	C.T.	6	6½	7	Negative	4½	6	10 D.	Positive
	L.C.	6	8	10 D.	Positive	4½	13 D.*	14 D.	,,
38	C.T.	8	9	10	Negative	6	9½ Tr.	13 D.	Positive
	L.C.	8	20 D.*	20 D.	Positive	7½	14 D.*	14 D.	,,
24	C.T.	6	8	8	Negative	5	8	11 D.	Positive
	L.C.	6	10 D.	15 D.	Positive	6	17 D.*	18 D.	,,
55	C.T.	5	6	6	Negative	5	6	9 D.	Positive
	L.C.	5	14 D.	16 D.	Positive	6	16 D.*	13 D.	,,
16	C.T.	5	6	8	Negative	5	6½	8 D.	Positive
	L.C.	5½	15 D.*	14 D.	Positive	6	12 D.*	14 D.	,,
36	C.T.	6	8	8	Negative	6	12 D.*	12 D.	Positive
	L.C.	6	8½ Tr.	16 D.	Positive	6	22 D.*	26 D.	,,
53	C.T.	6	8	8	Negative	5	6	8	Negative
	L.C.	6	10 Sl.	16 D.	Positive	6	10 D.	13 D.	Positive
46	C.T.	6	8	9	Negative	6	8 Tr.	14 D.	Positive
	L.C.	6	13 D.*	18 D.	Positive	7	16 D.*	18 D.	,,
70	C.T.	6	8	8	Negative	6	11 Sl.	16 D.	Positive
	L.C.	6	14 D.	18 D.	Positive	7	14 D.*	14 D.	,,
106	C.T.	7	9	8	Negative	6	8	9	Negative
	L.C.	7	9½	11½ VS.	Doubtful	6	10 VS.	12 D.	Positive
99	C.T.	6	6	7	Negative	5	6	8	Negative
	L.C.	6	6½	8½ VS.	Doubtful	6	9 Sl.	12 D.	Positive
113	C.T.	8	9	10	Negative	7½	9½	10	Negative
	L.C.	8	10	11 VS.	Doubtful	8	9½	9	,,
116	C.T.	6	Not	8	Negative	5½	6½	8	Negative
	L.C.	6½	noted	10 VS.	Doubtful	5½	6½	8	,,

D. = Diffuse. Sl. = Slight diffusion. Tr. = Trace of diffusion. VS. = Very slight diffusion. * = No second injection.

not contended that they had no opportunity to become infected during that period.

The results of this and the previous test are set out in Table IV.

The results may be summarised as follows:—

12 cows previously negative to C.T. but positive to L.C.:

9 reacted to both tuberculins.
1 was doubtful to C.T. but reacted to L.C.
2 were negative to C.T. but reacted to L.C.

4 cows previously negative to C.T. but doubtful to L.C.:

2 were negative to both tuberculins.
2 were negative to C.T. but reacted to L.C.

The evidence strongly suggests that at least nine of the twelve cows, despite their previous negative test to C.T., were infected animals. It is also clear that two cows negative to C.T. but doubtful to L.C. were non-reactors and it would appear that the higher potency of L.C. did, in these cases, give a pseudo-reaction on the occasion of the original test which was Mr. Golledge's first experience of L.C. tuberculin. The category of the remaining five cows may be uncertain but the general result does suggest the probability that they are infected animals of very low sensitivity.

The retest of 40 other cows which had shown discrepant results has been reported to us and

50 per cent. were then reactors to both tuberculins. The disagreement continued to exist in the remainder except in two cases. These two cows were clearly negative to both tuberculins on retest and it may be significant that they were members of a herd known to be affected with Johne's disease.

Post-mortem Examination of Cattle which Gave Disagreement Reactions

Quite early in this work it was realised that the suggestion that the more potent tuberculin had given the more correct result where there was disagreement could only be determined by the *post-mortem* examination of a considerable number of suitable animals. An attempt to arrange this in co-operation with persons engaged in the slaughter of cattle for human consumption broke down for reasons beyond the control of the writers. Since discrepancy has been most common among cows in good condition, a considerable sum of money would have had to be expended had these animals been purchased for slaughter. In these circumstances, it was felt that this very important work should be in the hands of some authoritative body, and with this end in view the work recorded herein was reported in April, 1938, to the Joint Tuberculosis Committee of the A.R.C. and M.R.C. and to the Ministry of Agriculture and Fisheries after we had had the privilege of discussing it with Professor Buxton, Professor Dalling and Mr. Glover.

The writers have, however, had the opportunity to examine *post-mortem* ten animals which had given discrepant test results and the brief particulars of these cases are:—

No. 1.—This heifer gave the discrepancy C.T. negative/L.C. doubtful and on retest was negative to C.T. but doubtful to U.S.A. and three L.C. tuberculins. There was no evidence of tuberculosis on *post-mortem* examination but the posterior mesenteric glands were enlarged, congested and soft. Lesions suggestive of Johne's disease were present in the latter part of the small intestine and acid-fast bacteria were present in small numbers in smears made from that site and from the glands. Guinea-pigs and fowls inoculated with mixed gland emulsion remained free from tuberculosis, but the bacillus of Johne's disease was obtained in culture from the glands.

No. 2.—This cow from the same herd persistently gave the disagreement C.T. negative/U.S.A. and L.C. doubtful and on *post-mortem* examination no evidence of tuberculosis could be found despite biological examination of various glands. Bowel lesions very suggestive of Johne's disease were seen but cultural examination was not attempted.

No. 3.—This cow, also from the same herd, was slaughtered one week after she gave the disagreement C.T. negative/L.C. positive, two months after she has passed tests using the two tuberculins. There was no evidence of tuberculosis but a large superficial abscess of the liver had caused much local disturbance. An emulsion of mixed glands was injected into a series of guinea-pigs. Tested four weeks later all gave doubtful reactions to O.T. in high dilution, but on *post-mortem* examination there was no evidence of tuberculosis.

No. 4.—This cow reacted to C.T. 18 months prior to a test when C.T. was negative and L.C. positive. Retested two months later the swelling at the C.T. site was large but negative in character and at the U.S.A. site and three L.C. sites positive, but of moderate character. No evidence of tuberculosis was found on *post-mortem* examination and none of the guinea-pigs inoculated with emulsion from various glands showed any evidence of tuberculosis on *post-mortem* examination.

No. 5.—This cow was negative to C.T. 18 months prior to a comparative test at which the reaction to C.T. was clearly negative but to L.C. positive. Retested two months later there was no reaction to C.T. and a positive swelling at the U.S.A. and three L.C. sites. On *post-mortem* examination six mesenteric glands showed small tubercles; some caseous, some calcified. The posterior portion of the bronchial gland was much enlarged and contained a mass of small caseous tubercles, while the mediastinal gland contained three small caseating tubercles. There was no macroscopic evidence of tuberculosis in any other gland or organ. Smears from the affected glands showed acid-fast bacilli having the morphology of tubercle bacilli and the histology of the lesions was typical of tuberculosis. Bovine tubercle bacilli were isolated through guinea-pigs inoculated with material from each of the glands mentioned.

No. 6.—This previously untested cow was at the seventy-second hour clearly negative to C.T. but positive to L.C. At the ninety-sixth hour a reaction swelling of good character was present at both sites. The cow was then taken into a perfect isolation and it was noted that the two reaction swellings resolved at about the same rate. Three weeks later a retest was carried out on the other side of the neck. At the forty-eighth hour there was a typically negative swelling at the C.T. site but obvious oedema at the site of injection of U.S.A. and L.C. tuberculins. The animal was examined daily for seven days thereafter. At no time did the C.T. site assume the character of a positive reaction. After the lapse of three months from the original test this animal gave a small positive reaction to C.T. and a very marked reaction to U.S.A. and L.C. tuberculins. She was then slaughtered and all organs and glands appeared normal except one submaxillary gland which showed a small lesion suggestive of tuberculosis. Acid-fast organisms were demonstrated by smear and the histology of the lesion was that of tuberculosis. Bovine tubercle bacilli were isolated through guinea-pigs inoculated with material from this gland.

No. 7.—One of us (R. F. M.) had the history of this cow from Dr. A. J. Wilsdon, then C.V.O., Herefordshire, and saw the final test and *post-mortem* examination through the courtesy of Professor Dalling. A member of a herd which had been free from reactors at four tests with C.T. covering a period of one year, this cow had been shown to be giving tuberculous milk. Very soon thereafter Professor Dalling tested with certain tuberculins which we supplied and with C.T. (at two sites). The results with tuberculins relevant to this article were:—

U.S.A. 650:
5 9 13 definite diffusion ... Positive

C.T.:
6 7 8 circumscribed ... ... Negative
2,106/2½:
5 7 10 definite diffusion ... Positive
2,111/2½:
6 7 10 trace of diffusion ... Doubtful
International Standard:
6 10 14 definite oedema ... ... Positive
C.T.:
6 8 10 circumscribed ... ... Negative
2,138/5:
5 10 9 suspicion of oedema ... Negative

On *post-mortem* examination immediately after this test the mesenteric glands showed widespread tuberculous lesions of some standing; the hepatic gland, one small tubercle; the bronchial and mediastinal glands, moderately extensive tubercles of recent origin; the supramammary gland, very early tuberculosis; and one quarter of the udder was obviously tuberculous. Professor Dalling confirmed these findings by smear examination and by biological test, the guinea-pigs showing lesions typical of those associated with the bovine strain of the tubercle bacillus.

Nos. 8, 9 and 10.—The writers are indebted to Mr. J. W. Bruford, of Sevenoaks, for the history, and the opportunity to see the tests and *post-mortem* examination, of these cows which were members of a herd producing accredited milk. The three had recently come under suspicion because of some loss of condition, but there was no clinical evidence of tuberculosis within the meaning of the Order. Examination of sputum did, however, show acid-fast organisms in the sample from No. 8. Simultaneously tested with C.T. and L.C., No. 8 and No. 9 were negative to the former and positive to the latter at the seventy-second hour, while No. 10 gave a positive reaction of poor type to C.T. and a large diffuse reaction to L.C. At the ninety-sixth hour the swellings showed no change in their character except that the diffusion at the C.T. site in No. 10 was so small that the reaction would then have been read as doubtful. On *post-mortem* examination each showed extensive tuberculosis of long standing of the visceral glands and lungs.

Of these ten cows, two which gave a negative/doubtful disagreement were affected with Johne's disease only and two which gave the negative/positive discrepancy showed no evidence of tuberculosis; one had previously reacted to C.T. and the other had a considerable liver abscess. Each of the remaining six cows was tuberculous. Five had given the clear cut disagreement C.T. negative/L.C. positive on one or more occasions. This series of cases is much too small to permit the drawing of conclusions, but it would seem that L.C. tuberculin is apt to give a pseudo-positive swelling particularly in cattle affected with Johne's disease, whereas the potency of C.T. is too low to cause reaction swellings in some tuberculous animals.

DISCUSSION

It was early suggested that the discrepancies observed when testing with L.C. and C.T. might be chiefly due to the strains of the tubercle bacillus used in their preparation being markedly different. Since it was known that B C G was very largely, if not exclusively, used for C.T., it appeared possible that the simultaneous testing of B C G vaccinated animals might settle this question. The writers were fortunate in having Mr. W. J. Ironside, of Loughborough, test with the two tuberculins 19 heifers vaccinated with B C G five months previously. Thirteen were about two years old and had been vaccinated on three or four occasions at intervals of six months. Each reacted to both tuberculins but the quality of the reactions to L.C. was superior. Four younger heifers twice vaccinated gave the same result, while two yearlings once vaccinated showed discrepant reactions; one was negative C.T./doubtful L.C., and one doubtful C.T./positive L.C. A naturally infected heifer tested at the same time reacted to both tuberculins but the L.C. reaction was markedly positive at the forty-eighth hour, while the reinjected C.T. swelling showed just slight diffusion at the seventy-second hour. While the difference in the quality of the reactions to the two tuberculins on these B C G-vaccinated cattle did not appear so striking as in the herd tests, it did not justify any contention that the use of the B C G strain in the production of C.T. was a material factor in producing the discrepancies seen in the field tests.

Another early suggestion was that the better positive reactions to L.C. were, at least in part, due to its greater tendency to diffuse from the point of injection. It arose from the observation that in negative cattle C.T. tended to remain localised at the site of injection and produce a firm pea or bean, whereas L.C. more often gave rise to little local swelling and appeared to have, largely, left the point of injection. If it be that L.C. tuberculin has a greater tendency to diffuse then, in affected cattle, one could expect reaction to occur over a wider area and so produce a larger, softer oedematous swelling. In any case, one is justified in regarding any differences in the degree of reaction following the injection of these tuberculins in affected cattle as being due to differing potency.

Since Cabot (1938) has drawn attention to the tendency of C.T. to produce a delayed positive reaction in some cattle, it may be suggested that the discrepancies found in this work were due to some extent to the results being read at the seventy-second hour. We have adhered closely to the technique recommended in the Medical Research Council Report (1928) and have only occasionally had the opportunity to re-examine cattle after the completion of the test. Cabot found that the incidence of delayed reaction in cattle which had previously been subjected to the test is significant. One of the highest discrepancy rates here recorded was

encountered among a group of cows being retested after an interval of one month, and we have no evidence that previous testing in any way influenced the occurrence of discrepant reactions. The one delayed reaction encountered in this work occurred in a previously untested cow which on retest failed to react to C.T. but later gave a poor positive reaction; being clearly positive to L.C. on each occasion. Tuberculosis was found in only one gland when this animal was submitted to *post-mortem* examination. The writers hold the view that delayed reaction may well be due to the use of tuberculin of low potency and believe it cannot be accepted as a main reason for the discrepancies which they have recorded.

There is ample evidence that L.C. tuberculin has been used at a potency distinctly higher than that of C.T. Only very rarely has C.T. given a more characteristically positive swelling in animals reacting to it and to L.C. The quality of the reaction to each tuberculin has maintained its comparative level with marked regularity, being above or below the average for C.T. where it was so for L.C. By how much the potency of L.C. exceeds that of C.T. is a matter which will be dealt with on another occasion.

In a small herd of 14 dairy cows, Blount (1938) found that bovine synthetic tuberculin supplied by Messrs. Bayer Products, Ltd., caused reaction swellings in those animals reacting to C.T. and also in some which were negative to the latter product.

In the absence of any officially accepted standard of potency for tuberculin for use in the double intradermal test, it has been open to any individual preparing this diagnostic to chose the level at which it be issued. The Cambridge workers chose a potency equal to that of their "standard" for Old Tuberculin, but as Glover (1937) has pointed out, there has been no volume of evidence from the *post-mortem* examination of cattle simultaneously tested with Old Tuberculin and with synthetic medium tuberculin to justify any conclusions as to the relative value of these products. Buxton and Glover (1933) summarising the results of the simultaneous testing of 915 cattle with "standard" O.T. and with synthetic medium tuberculin noted that 23 discrepancies were found, only nine of which were clear cut. There was no *post-mortem* evidence to determine which tuberculin had given the correct result.

The main purpose of this work was to determine whether further careful investigation of the potency at which synthetic medium tuberculin should be used in the double intradermal test was, as suggested by the early preliminary observations, urgently necessary. The scope of this work has certainly been sufficient to justify conclusions on that point. Since there has been such marked discrepancy, often even alarming in extent, between the results with the two tuberculins the writers have no hesitation in contending that the need for further work has been amply proved.

It is not maintained that the tuberculin of lower potency has been proved less suitable for the purpose in mind. Much suggestive evidence has been obtained, but that matter could only be settled by a long series of *post-mortem* examinations on cattle which had shown discrepant results. Such work is difficult to arrange and entails the expenditure of so much money that the writers have felt fully justified in placing their results before authoritative bodies in the hope that they will see their way clear to carry through an investigation on these lines.

Even in the absence of this decisive evidence, what has been done does suggest that the tuberculin of higher potency is the more suitable. It is generally accepted that the sensitivity of cattle to tuberculin varies within wide limits and that animals in the advanced stages of the disease are often particularly low in sensitivity. Several examples of known tuberculous cows whose sensitivity was so low that the tuberculin of lower potency failed to stimulate a positive reaction has been recorded in this paper. In other cases there is strong presumptive evidence, such as reaction to U.S.A. tuberculin, or reaction to all tuberculins on retest, that animals negative to C.T. but reacting to L.C. were, in fact, tuberculous. There is some evidence from the *post-mortem* work, limited as it was, that the tuberculin of the lower potency did fail to cause a reaction swelling in affected animals; some slightly affected, some extensively, one even excreting tubercle bacilli in the milk.

The *post-mortem* work has also shown that some animals apparently not affected with bovine tuberculosis react, or tend to react, to the tuberculins of higher potency. It is probably correct to assume that the higher the potency of the tuberculin the more likely reaction in animals sensitised by infection with acid fast organisms allied to the bovine tubercle bacillus. There is evidence that animals affected with Johne's disease show more tendency to react to tuberculin at the L.C. potency and the writers have recently obtained some evidence that those infected with the avian type of the tubercle bacillus are in the same category. It is clear, however, that some of the cattle which had shown discrepant reactions were cases of true bovine tuberculosis and infection with the avian strain or with the Johne bacillus cannot be accepted as the main cause of the discrepant reactions which have been found.

The writers have some evidence to support their belief that the sensitivity of infected

cattle fluctuates. If this be true, the use of a low potency tuberculin may explain many of the variations in result which have led to so much trouble in the retesting of animals which have been tested by another practitioner or even by the same individual. One is entitled to assume that a low potency tuberculin may fail to detect reactors in herds from which the disease is being eradicated. In such circumstances the process of cleaning up would become a protracted business and the occurrence of a disheartening breakdown quite possible. It may be that the potency of the tuberculin in general use has been at the root of some of the difficulties in eradicating the disease from certain herds and even responsible for the introduction of infected non-reacting cows to clean herds. One experience in this connection is illuminating and we are indebted to Mr. Eoghan Clark, then C.V.O. for Surrey, for the history and particulars of this herd which was first licensed as Tuberculin Tested in January, 1936. It had been tested with C.T. at intervals of six months until December, 1937. Until the latter date an occasional reactor, ten in all, had been detected and eliminated. All the cattle passed the test applied in December, 1937, but on clinical examination one newly calved cow showed mastitis of the left hind quarter. Microscopical examination of the excretion from this quarter showed only streptococci but a biological test for tubercle bacilli was positive. Re-examination then showed that the cow had lost some condition and that the affected quarter was slightly indurated. This cow had consistently given a negative swelling at each test from October, 1935, to June, 1937. On the latter date she gave a doubtful reaction but was negative on retest 14 days later and again passed the test, as did all the other cattle in the herd, in December, 1937. A few days before slaughter, under the Tuberculosis Order, on January 26th, 1938, she gave a positive reaction. On *post-mortem* examination the carcase was found extensively affected with tuberculosis and the lesions in the mesenteric glands were old and calcified. In view of this result the herd was retested with C.T. on February 11th. Then 17 of the 39 adult cattle reacted. At our suggestion Mr. Clark retested, with C.T. and with L.C., on the other side of the neck one week later. Now 24 animals reacted to both tuberculins; six negative and three doubtful to C.T. reacted to L.C. and one negative to C.T. was doubtful to L.C. There were, therefore, only five negative to both tuberculins. In December, 1937, this owner had reason to believe that his herd was clean; in February, 1938, he knew it was grossly infected. Whether the cow slaughtered in January was responsible for all this infection may be doubted, but there is no evidence of an extraneous source and one is forced to the conclusion that the use of a low potency tuberculin may well have been responsible for the breakdown. We have heard of similar instances in other herds and practitioners have even stated that they could not credit that the incidence of tuberculosis in certain herds, whose history they knew, was as low as a preliminary herd test suggested. Others have been puzzled by their failure to eradicate the disease despite repeated testing. All these difficulties could be ascribed to the use of tuberculin of low potency and it must be generally accepted that the higher the potency of the tuberculin employed the more likely detection of all infected animals.

Glover's work has shown the danger associated with the use of too potent material and the writers' use of L.C. tuberculins at their original potency demonstrated its tendency to produce occasional pseudo-reactions in clean cattle. It was for this reason that its field use was restricted to diluted material of a potency, as judged by the guinea-pig intracutaneous test, equal to two-fifths International Standard. The difficulty of making certain that no tuberculous lesion exists in a cattle carcase is generally admitted. Yet, among the ten animals submitted to *post-mortem* examination, L.C. tuberculin caused a doubtful reaction in two apparently affected with Johne's disease only and a positive reaction in two other cases where no tuberculosis was found. If the tuberculin of higher potency (L.C.) does tend to cause reaction in cattle affected with Johne's disease it need not be argued here whether this would be an advantage or a disadvantage. L.C. tuberculin suitably diluted has now been so widely employed in the testing and retesting of clean cattle that the incidence of pseudo-reaction, if that does still occur, is unlikely to be troublesome when tuberculin is used at that potency. Yet, one would agree with Glover (1938, p. 47) that, "Every effort should be made to protect the practitioner and the cattle owner from preparations which may be capable of inducing non-specific pseudo-positive reactions in non-tuberculous cattle." It may, however, be contended with even greater force and more reason that these persons must be protected against the use of tuberculins so low in potency that a material proportion of affected animals escape detection when their sensitivity is low. The leaving of a tuberculous animal in a herd otherwise clean, or the introduction of a non-reacting affected cow, may well damage the reputation of the practitioner and the pocket of the owner to an extent far beyond that produced by the exclusion, even slaughter, of an occasional clean animal which has given a pseudo-positive reaction. It is in this belief that the writers present this work

as a contribution to the study of the potency of synthetic medium tuberculin for use in the double intradermal test.

Summary

(1) Synthetic medium tuberculin (ammonium sulphate precipitated) as originally prepared in these laboratories appeared too potent to be used in the double intradermal test. It had some tendency to produce pseudo-positive reactions in clean cattle.

(2) Diluted to a potency approximately equal to two-fifths International Standard Tuberculin, as judged by the guinea-pig intracutaneous test, it (L.C. tuberculin) appeared suitable for this purpose.

(3) Compared by the simultaneous testing of known infected cattle with the tuberculin now in general use in Great Britain (synthetic medium tuberculin issued by the Royal Veterinary College) this L.C. tuberculin was distinctly higher in potency.

(4) These two tuberculins employed simultaneously in the field have given widely discrepant results in infected herds; L.C. tuberculin causing reaction in animals negative to the other. The level of disagreement varied from 3 to 43 per cent. Of the 579 cattle in the first eleven herds tested simultaneously, 32·1 per cent. were positive, 49·9 per cent. were negative and 0·7 per cent. doubtful to both tuberculins, whereas 14·2 per cent. showed complete disagreement and 3·1 per cent. partial disagreement in their reactions.

(5) In clean herds there has been close agreement; all, or almost all, the animals giving negative swellings to each tuberculin. The type of negative swelling differed somewhat; L.C. tuberculin gave little increase in measurement, or only a small soft pea, in contrast with the firm pea or bean characteristic of the negative to the other.

(6) Simultaneous testing with U.S.A. Department of Agriculture tuberculin and the retesting of cattle which had given discrepancies suggested that L.C. tuberculin had very generally been correct in placing the animals as reactors.

(7) Very limited opportunity for the *post-mortem* examination of cattle which had shown discrepant results suggested that L.C. tuberculin occasionally gave reactions which were falsely positive or doubtful; in the latter case apparently because the animals were affected with Johne's disease. In other animals the contrasting positive reaction to this tuberculin was the correct one; some being slightly affected, some extensively.

(8) The discrepancies appear to be related to the difference in potency. It is suggested that the advantage associated with the use of tuberculin of higher potency outweighs any disadvantage attached thereto.

(9) It is pleaded that further work on the potency of tuberculin for use in the double intradermal test is urgently necessary.

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A Note on the Reliability of the Avian Tuberculin Test

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Quite a number of veterinary surgeons are sceptical as to the value of the tuberculin test in poultry, believing that it is not as accurate as that applied to cattle.

However, the writer is one of those who consider it of great value in controlling avian tuberculosis and has not found it give the uncertain results recorded by some workers. Indeed, if certain precautions are taken, it is definitely a reliable test and although not one which can be applied by the average poultry keeper himself, it is simple enough for the veterinary practitioner.

Several years ago the writer tested a number of avian tuberculins and found that that manufactured by Bayer Products was the most satisfactory, so that since that time no other has been used, and therefore it would not be fair to criticise other brands now on the market. The product in question is light brown in colour, sticky and of a characteristic smell. The manufacturers state that it can be diluted

half-and-half with distilled water, but if used undiluted it gives excellent results.

The injection is made between the two walls of the wattle, and is, therefore, not intradermal, and the dose is from 1/20 to 1/10 c.c., according to the size of the bird to be tested. If the wattle is held firmly between the thumb and first finger of the left hand, the point of the dental syringe needle can be inserted between the two layers of the wattle and the tuberculin injected easily. Some birds tend to jerk the head away, therefore the hold on the wattle should be really firm.

The injection of tuberculin should be made half-way up the wattle—mid-way between the border and its attachment to the mandible. During the injection of the tuberculin, the wattle will be seen to swell perceptibly and care should be taken to see that the needle does not project right through the wattle, and also that most of the tuberculin is retained within the wattle and does not exude through the opening made by the needle.

The reaction can be read from 24 to 48 hours later and there is no necessity to visit the farm at any exact hour. The first essential in reading the result is to rely solely on touch and *not* on the appearance of any swelling noted. A number of veterinarians consider that a positive reaction will be sufficiently marked to be *seen* without any necessity to handle the birds. This is definitely not so, for although a large percentage can be observed easily, numbers of infected birds will be missed if reliance is placed on the naked-eye appearance of the two wattles.

If the reaction is negative, the injected wattle will be found little different from the control uninjected wattle. Any swelling noted will be localised to the injection site and will not be soft or oedematous. Discoloration due to slight haemorrhage within the wattle may be observed, but the lower free edge of the wattle will be normal and thin, exactly as with the control.

Any swelling due to oedema must be counted positive. In every case it will be found to have gravitated to the bottom of the wattle which is, therefore, thickened (due to an infiltration of lymph) and which contrasts markedly with the bird's second, uninjected wattle which will be found to have a characteristic thinness. All degrees of oedema may be found and in advanced reactions the whole organ will be swollen, and quite frequently will be found where spread to involve the other wattle.

If any thickening of the wattle due to oedema is counted positive the test will be found to be quite reliable, but *all* degrees of oedematous infiltration must be accepted as indicative of tuberculous infection and not merely gross enlargement seen only in typical cases.

If the fingers are sensitive, heat may be noted accompanying the swelling; this may be important because there is some evidence to show that an infected animal in the incubative stage of the disease may give a reaction free from oedema but characteristically hot. Such an animal tested ten days later will give a normal tuberculin positive swelling.

The avian tuberculin test may have been considered a failure in the past because a number of animals tested and reacting positively have been found at *post-mortem* examination to be free of lesions. As a fact, it is probable that a number were merely free of gross lesions in the two most commonly affected organs, namely, the liver and spleen.

In conducting a *post-mortem* examination on a tuberculin-positive bird where typical lesions are absent, it is necessary to carry out a number of microscopic examinations from suspected tissues. In the first place, since 90 per cent. of cases arise by ingestion of the bacillus, very careful examination of the small intestines should be carried out. Isolated tuberculous lesions are seen externally as raised, low, flat, pale tubercles. Internally, if the lining membrane is lightly scraped the ulcerous nature of the lesion is evident and material from this part will show numerous acid- and alcohol-fast rods. One case recently examined showed only two such discrete nodules and there were no other *post-mortem* findings suggestive of tuberculosis, yet the tuberculin test was a clear positive, and typical bacilli were demonstrable.

If the intestines show no such nodules then small pieces of liver or spleen should be taken and compressed between glass slides, and if fine cheesy areas are noted such slides should be stained Ziehl-Neelsen for typical bacilli. If, however, the liver or spleen show on their surface any whitish spots, no matter how small, these should be treated similarly for demonstration of the causal organisms. It is noteworthy that even when there are as few lesions in the liver as half a dozen, the organ generally may be degenerate, friable and brownish tinted instead of the normal mahogany colour.

Affected pullets detected in the early stages of tuberculosis are often in lay and frequently in good condition, so that their clinical appearance bears no relationship to the disease in its initial stages; further, in a small percentage of cases fat birds may be discovered with multiple lesions of the liver, spleen, intestines, mesentery or bone marrow.

The Suffolk Diseases of Animals Joint Sub-Committee have decided to send a resolution to the Ministry of Agriculture suggesting that the period of time between the drafting of swine fever infected area orders and the date they come into operation should be reduced.

The Veterinary Record

December 24th, 1938

The Loveday Report:

THE TRAINING OF RESEARCH WORKERS; A SUGGESTED ENQUIRY INTO UNQUALIFIED PRACTICE

(*i*) "Behind the practitioner stands the research worker, whose discoveries make the veterinary art constantly less empirical, more scientific . . ." (paragraph 1).

(*ii*) "We have made an estimate of the probable number of veterinarians likely to be required in the future. . . . Germane to the demand for such is the support given by the public to unqualified practitioners. . ."

"We felt that, if we were to carry out a full enquiry into this question, we should be going beyond our terms of reference; *but we recommend that a special enquiry into the subject be instituted by the Government*" (paragraphs 115 and 118).

INCONGRUOUS as at first sight a combined discussion appears to be of the above two topics, which we have chosen to conclude our major survey of the Loveday Report, we venture to think that after a little reflection it will commend itself to the experienced veterinary reader for its appositeness. Neither topic fell strictly within the terms of reference of the Committee. Yet it is evident to any discerning critic that the Committee would have failed in their appreciation of the special problem with which they were entrusted if they had not called attention to the relevancy of these topics. Early in this series of articles we expressed our considered view that the special difficulties which confronted the Loveday Committee in making recommendations for imparting an ideal system of veterinary education were largely the outcome of neglect on the part of recent Departmental Committees, appointed to enquire into specific veterinary problems, such as research, the overseas services, and the rebuilding of certain Schools. These committees might have stated pointedly that the larger issues of the whole system of veterinary education ought to be investigated, or they might even have demurred to their tasks until these major issues had been resolved. Having formulated a system of veterinary education on the general plan of an "applied science," it was plainly the duty of the Loveday Committee to express the cogency of two contingent issues: first, the means whereby exact knowledge was to be derived for such teaching as was worthy of the name of "science," in the clinical no less than in the non-clinical fields of study; and, secondly, the means whereby the public was to be protected against exploitation by people who had not undergone the resultant costly and laborious training essential for the qualified practitioner. While it remains true that in matters of health and disease the human mind, in all classes of the community, falls a ready and willing victim to the unscrupulous practices of unqualified persons, it is the special inter-relationship of the above two issues that makes of medicine, human and veterinary, a pursuit which has called for strict and privileged organisation on a professional basis, in a manner that is not essential in the case of most of the other natural sciences.

(*i*) Research.

Let us recall that it was failure to observe the wise regulations laid down at the institution of the London Veterinary College in 1791, to pursue a steady course of research, for the provision of truthful information to be taught to the students, that produced in large measure the degradation of the veterinary profession in its early history in this country. Let us now take note that in this next authoritative pronouncement upon the planning of veterinary education, after the lapse of a century and a half, which has been presented in greatly changed conditions for appreciation of the merits of research, the beneficial impact of research upon the teaching at the veterinary schools has been carefully weighed. It will be, to our mind, the greatest possible disservice which the governing bodies of Schools can render to the cause of veterinary education and to the future of the veterinary profession if, in the steps they take in the appointment of teaching staffs and in the provision of facilities for their staffs to advance by the methods of research, they fail to create that atmosphere in the Schools under their control which will inspire the veterinary student to zeal in advancing his profession, in the only sure way in which it can be advanced, namely by adding to its store of exact knowledge.

We have stated that one of the fundamental principles in devising a system of veterinary education ought to be that the course should be designed towards a single objective—the

production of a *competent veterinarian.* The Loveday Committee are no less emphatic on this point. "Our advocacy of research at educational centres," they say (para. 113), "is not based on a conception of training candidates for the M.R.C.V.S. to become research workers. The training of research workers is principally a post-diploma matter. . . ."

In analysing a report upon veterinary education, however, it is to the qualities that are said to be demanded in the teacher we must direct chiefly our attention. ". . . Under present conditions," the Report says (para. 55), "the quality of the teaching is in many ways most unsatisfactory. This is generaly due to under staffing and to the lack of time available to the teachers for keeping themselves up to date by reading or by research. . . ."

During the period which Professor Leclainche has called the golden age of veterinary progress, which corresponded with the great advances of knowledge following the Pasteurian discoveries towards the latter part of the last century, the Continental veterinary Schools were staffed with men who were both brilliant teachers and investigators. The British Schools were not so well favoured. Shortly before the War, however, and gaining momentum after the War, the movement was set on foot to undertake research at specialised research institutes. Hence, whereas formerly the results of investigation were forthcoming almost exclusively from the teachers at the Schools, as their part-time or spare-time occupation, work to advance knowledge in special directions is now pursued systematically, mainly under State endowment, at special centres, and a special cadre of workers is required to staff these centres. The Loveday Committee has taken due account of the changed circumstances, and the peculiar problems in research that fall aptly to be undertaken consequently at the Schools:—

> ". . . the conduct of research by teachers in the Schools is regarded by us as essential in the interests of both the teaching and the teachers. Research should not be regarded as an accessory or luxury; it reacts on teaching, and teaching reacts on research. Teaching is apt to become stereotyped where the feeling for progress does not exist. Even where classes are large the teaching is more inspiring if the teacher has contacts with research. We regard it as of the first importance that the staffs of the Schools should have spare time for research. *This does not mean that research should be allowed to overshadow teaching, neither does it involve any disapproval of the provision for research in specialised institutes.* [Our italics.] The research at the University or at the Veterinary School is distinct in character from that at the Research Institute. At the former it is of a fundamental and disinterested nature, undertaken for the advancement of basic knowledge; at the latter it is justifiably organised for *ad hoc* investigations bearing on immediate needs. In the one case it may be carried out individually, while in the other team work is generally necessary. Both kinds of work are needed, and in the long run fundamental work is likely to accelerate and facilitate applied research . . ." (paragraph 112).

Commenting upon the special training of graduates destined for research careers, the Report says:—

> "We are in agreement with the policy of giving men who are to be veterinary research workers experience in University departments where research is carried out. We are not, however, in favour of a suggestion which was made to us that post-diploma studentships should be attached to particular Schools, unless they are the result of private endowment. It is very desirable that before embarking on such training the student should take a University Degree in order that he may be qualified for a higher Degree in his further University studies" (paragraph 113).

The few graduates who have had most intimate experience in shaping their careers to undertake veterinary research during the past quarter of a century will have no doubt concerning the wisdom of these suggestions. Bearing somewhat upon these suggestions it has also been pointed out to us that the directors of several research institutes engaged upon *ad hoc* investigations into the various aspects of animal husbandry (such as dairying, animal nutrition, and animal genetics) have been experiencing very real difficulty in recruiting to their staffs suitable young veterinary graduates to undertake the special problems that would naturally fall to them there.

> "If . . . the veterinarian of the future," the Loveday Report says, "is adequate to carry out the work described it is essential, that his training should be on as wide and practical a scale as is possible. He will, of course, not be the only one able to guide stockowners in all matters regarding the care of animals and for specific purposes. The term 'husbandry' is so wide that its various aspects can be covered only by the combined efforts of those engaged

> in all branches of agricultural science . . ." (paragraph 31).

The shortage of suitable recruits to work in collaboration with other workers at the above Institutes would be due, without doubt, to an absence at the Schools of special training and encouragement, a deplorable state of affairs which the Loveday Report now seeks effectually to dissipate. At the great Medical Research Institutes of this country, it is a cause for pleasure and gratification that veterinary collaborators in recent years have been made welcome. The staffs of these Institutes are by no means confined to medical workers but usually comprise a variety of workers specially fitted from their specialised experience for the immediate tasks on hand. At all such institutes, we can see nothing but advantage accrue, both to the individual veterinary graduate and ultimately to the whole of the veterinary profession, from close association with earnest workers in related callings who will have opportunity thereby to measure our real worth.

The Loveday Committee have made no recommendation for a special enquiry into the training and recruitment of veterinary research workers being apparently content with the standing authority of the Agricultural Research Council as a supervisory body—a body whose lack of wider veterinary experience we have often, however, had some cause to lament.

The prospects of recruitment to this new and difficult branch of veterinary work will improve materially, we have reason to think, only when the prospective recruit feels he is in daily contact during the early difficult years while he needs guidance with older workers of his own calling who are engaged in actual work upon the same task, and who are in full sympathy with his aspirations and can help him through his perplexities.

(*ii*) Unqualified Practice.

With all that has been said in analysis of the complicated training required for the equipment of the veterinarian to qualify him to undertake practice, it would seem almost unbelievable that the public is so often completely blind to the difference between the qualified and unqualified individual. Upon this subject the Loveday Committee shortened its examination and, obviously in view of the grave importance they attached to it, urged Government to undertake a special enquiry into it. They have published in a valuable Appendix (VII) a summary of clauses of certain overseas Veterinary Acts relating to practice by unqualified persons, which was taken from evidence submitted by the R.C.V.S. Conspicuous among the States that have taken action to suppress unqualified practice is Eire, where under an Act of 1931 it has been declared unlawful "for any person to practise or to represent or hold himself out, whether directly or by implication, as practising or being prepared to practise veterinary surgery or veterinary medicine unless he is for the time being a registered veterinary surgeon." In Britain, however, "evidence was received by the Committee of the wide-spread existence of practice by unqualified men and women financed in part by the subscriptions of charitably-minded persons. It was represented that the public should receive better protection in such cases. . . ." (para. 116.) Pertinent to such an enquiry as is urgently demanded would also be the widespread traffic in veterinary "secret remedies" the prohibition of which very few States, such as the Union of South Africa, have attempted; in most States this reprehensible commerce thrives unchecked, largely because of the huge financial, including advertising, interests involved. In a footnote to his chapter on the progress of veterinary medicine since the foundation of the veterinary schools, Professor Leclainche, in his historical text-book says: "It is by millions of pounds that must be reckoned the yearly sales of veterinary specialities in the world and nine-tenths of these preparations have no value whatsoever. This form of charlatanism, which is the most dangerous of all forms, is almost everywhere tolerated. Germany alone has begun against it a campaign which one can only hope will be intensified. Already the advertisement of these remedies cannot be suppressed in human medicine, because of the enormous profits it procures for the popular Press." The situation, as it is really well-known to all veterinary surgeons, is given here in the words of the above quotation for the reason that these words are appended in a footnote to a passage in Professor Leclainche's text which contains a grave warning to the veterinary profession itself and which we feel must be reproduced for its relevancy in this present article. Commenting on the progress of veterinary therapeutics (p. 776), he states:—

> "One may say that at the present time veterinary medicine employs all the exploratory and diagnostic methods applied in human medicine. It also utilises all the resources of a system of therapeutics which

> is as bewildering, viewing the multiplicity of measures it entails, as it is uncertain, viewing the results obtained. In place of the older medicaments, the indication for the employment of which could be defined precisely and which were trustworthy in their action, there has been added or substituted a flood of pharmaceutical products almost entirely founded on the claims of advertisement, and the excessive use of such preparations cannot fail to be gravely prejudicial to veterinarians, as they are for medical men. It is regrettable that neither teachers nor practitioners have understood that this abuse of pharmaceutical specialities diminishes the rôle of the practitioner and prepares the way steadily for his disappearance."

We need not here dwell upon the many aspects of this disturbing problem or anticipate the revelations of the official enquiry recommended in the Report under review. It is our stern duty to the profession and the public to press for such an enquiry at the earliest date. There is one aspect of the problem, however, which need not await the findings of a special enquiry—the aspect which is brought into relief by the warning uttered in the above quotation by a distinguished contemporary veterinarian and which is also touched upon with much circumspection in the passages we have reproduced from the Loveday Report at the beginning of this article. Several other passages likewise deal with it. It is the aspect of the above problem that deals with our own relationship to the public. This is a relationship which stands to be cultivated studiously so that without question we can assert that nothing is lacking in our own competence, methods, and behaviour that has caused the public to have resort to the solace placed within its easy reach by pretentious exploiters. In this respect, despite the great increase in whole-time employment in the public service, it is the private veterinary practitoner who still remains pre-eminently the bulwark to protect the public against such impositions. It has been pointed out by Professor Leclainche at the close of his studies upon the evolution of the profession, as a noteworthy phenomenon, that in the western civilised communities an increasingly large proportion of State measures introduced for the control of disease fall to be worked out by private practitioners whereas eastwards and elsewhere in the world in more primitive countries veterinary work is dominated by permanent officials. The qualities demanded in the private practitioner are indeed those of sympathy with and insight into the mind of the general public, as individual citizens, and a capacity to interpret the special knowledge of his vocation to the public in language which it can understand, and which, in a civilised country, it has every right to claim. For certain measures of control, whole-time public servants are essential, but the qualities required in them are different, as these workers stand in relationship with the public as a mass, not as individuals, and some qualities which the public commonly associates with them, of "power" and "secrecy," do not always commend them to its affections. The research worker who "stands behind" the practitioner, as he does also behind the public servant, need not cultivate a relationship with any members of the public except those in his own pursuit or closely related pursuits, and it has been well said that for each branch of science there grows "a language within a language," which is not intelligible to the general public or to workers outside that branch. A great and increasingly difficult task therefore falls upon the good teacher whose duty it is to interpret to prospective practitioners the discoveries of the research worker which "make the veterinary art constantly less empirical, more scientific. . . ." and the task of the practitioner in interpreting these teachings in turn to the public becomes always more onerous. Used in the sense in which the Loveday Committee doubtless intended it to be understood, namely, the sense in which it is used in philosophic discussion, the term "empirical" need not have any meaning of reproach. An immense proportion of the useful knowledge of the veterinarian must long remain "empirical," that is, derived from valid experience rather than from the deductions of scientific experiment. In the sense in which the word is used as a term of reproach in common speech, however, it is incumbent upon us to divest ourselves of its stigma by all the disciplinary measures of a thorough education which we can bring to bear upon our actions. Hence, in a proper system of veterinary education the activities of the research worker must be encouraged and promoted by every means and a way found for him to ensure close and frequent contact with the occupants of other positions in the profession so that he may communicate to them the fruits of his research.

Some useful paragraphs in the Loveday Report deal with Advanced Courses and Refresher Courses, and Special Courses on Poultry, all of which contain valuable observations upon the methods whereby

the graduate ought to be provided with opportunities to keep abreast with advancing knowledge in special fields of study. In particular, we would like to commend the high appreciation the Committee have shown for the potential value of the F.R.C.V.S. as a "professional hall-mark" of high attainment, a recognition which unfortunately has not been paid to it in the past by a large number of graduates. A point which the Committee omits to mention, but which Professor Leclainche has stressed, is that in the present organisation of the N.V.M.A. one of the finest systems in the world has been evolved for disseminating post-graduate information among practitioners at the various meetings of its Divisions and Branches. Fortified by the knowledge so placed, as it ought to be, within his reach and by the cultivation of his own personal qualities, it is our belief that the practitioner stands little to fear in the long run from the competing claims of charlatanism. Commenting on an illuminating address recently delivered by Sir St. Clair Thomson on the great medical personalities of the Victorian era, our contemporary, *The Lancet* (1938, December 3rd, 1308) says:—

> "The biographies suggest that the public is not permanently attracted by any meretricious methods, but that the personality of the practitioner is what counts. 'In our days,' he (Sir St. Clair) said, 'when medicine is rapidly becoming more and more scientific, the doctor is perhaps better able to mould his career without devoting so much care to developing and applying the art of his profession. But he will better succeed, and be a happier man, if he preserves his humanity, always remembering that the patient's first anxiety is to be cured and not merely studied."

The precepts given by one of the greatest of these personalities, Sir James Paget (1815-99)—"a scientific surgeon, a great teacher, a delightful writer, and a captivating orator"—would apply with equal force to the veterinary student as to the medical student. They are as essential, we are sure, to his success as anything we have commented upon so far in the course of our review:—

> "Anyone with a safe knowledge of his profession and free from such faults—that is, idle, time-wasting, unbusinesslike, unpunctual, uncivil, unable to work with others—may be as certain of success in the practice of medicine or surgery, or both, as in any other business of life; or even more certain, because his prosperity may be very nearly independent of that of others."

We shall therefore conclude this series of articles by one short quotation found at the end of the first paragraph of the Loveday Report. After dealing with the relationship of the research worker to the veterinary practitioner, the Report says: ". . . *but much more remains for him to do.*" These words contain our faith in the future of our calling. The history of our profession is largely a record of missed opportunities, and many of the fruits we now enjoy would have been missed were it not for the zeal of a few devoted men. Let us miss no more, and thank the Loveday Committee graciously for their labours at this critical stage in our history, in stirring us to renewed zeal in promoting our own best interests in the service of the public.

THE COWMAN "ARISTOCRAT"

"As the number of herds producing accredited or other high-grade milk increases, so the number of cowmen trained in the management of "clean" herds grows with it. This training is making itself evident at the hiring fairs," observes the *Farmers' Weekly*. "Cowmen with experience of accredited milk production are at a premium, and in many cases standard wages are not enough to persuade them to work on a farm producing ordinary milk. Once a man is established on a 'clean' farm, he is often reluctant to change over to a farm producing a lower grade of milk. And there is a good deal to be said for this point of view. The work is more interesting on an accredited or tuberculin-tested farm and there is the added attraction of a natural pride in a job well done. Then again, of course, clean milk production often goes hand in hand with a bonus on results which is certainly another inducement."

* * * * *

At a meeting of the Society of Public Analysts, held on November 2nd, a paper was read by H. Wilkinson on the seasonal variation in the vitamin A and D contents of butter. He said that two series of butter taken at monthly intervals, one in Scotland and the other in Denmark, were assayed biologically for vitamin A and D. The typical monthly variation was shown in both series, the highest vitamin-A value being obtained when the cows were on grass. The variation in the vitamin-D potency of the Scottish butters had been related to the variation in the amount of sunshine received by the cows on pasture. The vitamin-A potency ranged from 8·0 to 29·9 international units per gramme in the Scottish series, and from 10·8 to 56·7 u.p.g. in the Danish series. The vitamin-D values ranged from 0·08 to 0·99 international units per gramme and from 0·08 to 0·54 u.p.g. in the Scottish and Danish samples respectively.—*Pharm. J.*

ABSTRACTS

[Lymphomatosis. Thirteenth Int. Vet. Con. Paper, 1938. I. Lymphomatosis (Fowl Paralysis) in Great Britain. DALLING, T. II. Lymphomatosis, STUBBS, E. L. III. Lymphomatose des Poules. BRAGA, A.]

The term lymphomatosis as used in Great Britain is applied to the condition in fowls characterised by infiltrations of lymphoid cells into the nervous and other tissues. Fowl paralysis is the name applied to a manifestation of the disease seen when the nerves supplying the wings or legs are affected. The term neurolymphomatosis was formerly used but as in many cases the nerves are not infiltrated, the term lymphomatosis is preferred by Dalling. On the other hand, Stubbs (U.S.A.) and Braga (Brazil) consider that the title, lymphomatosis, covers several diseases as well as fowl paralysis. According to Braga and several American authors, these various conditions are different manifestations of the same agent. Stubbs, however, considers it improbable that lymphomatosis and leukaemia (myeloid and erythroleukaemia) are caused by the same agent; he also differentiates lymphoid leucosis (hepato-lymphomatosis or "big liver disease") from neurolymphomatosis (fowl paralysis) on the ground that in the latter disease the liver is rarely affected. Moreover, lymphoid leucosis has never been transmitted experimentally whereas there is some evidence of successful transmission of neurolymphomatosis.

Fowl paralysis is a common and serious disease of fowls in Great Britain and the U.S.A., but according to Braga it is rare in Brazil, the native strains of fowls apparently being resistant to it. The symptoms and lesions of the condition are described; with reference to tumour formation, Dalling mentions that he found tumours in almost all the tissues, including the liver, these tumours being composed of the same type of cell as is found in affected nerves. In his own experience he found tumours in 79 of 128 fowls affected with neurolymphomatosis, and he quotes Blakemore, who found tumours in 40 per cent. of 38 outbreaks of the disease. The eye lesions are discussed and it is pointed out by Dalling that although all eye abnormalities may not be associated with lymphomatosis, there is much evidence that these structures are commonly involved and their affection may be the most marked clinical feature of some outbreaks.

As for the blood changes claimed by some authors to be diagnostic, he states that it is generally agreed that at certain stages of lymphomatosis there may be found an increase in the total lymphocyte count, but as has been shown by Blakemore, the rise does not appear to be a constant feature and the fluctuations in the number of leucocytes present in normal fowl blood are sufficient to make a total count valueless for diagnostic purposes.

The aetiology of fowl paralysis is still obscure, but it is agreed that it may be transferred to fresh premises by the purchase of eggs, day-old chicks and adult stock. Some strains of fowls are apparently more susceptible than others and there is evidence that heavy parasitism and other adverse conditions, though not the actual cause, may have some effect on the incidence and the severity of outbreaks. The importance of individual and strain susceptibility is stressed when experimental transmission is discussed, the widely varying results of different workers being mentioned.

The necessity for intensive research on a large scale is emphasised.

C. McG.

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[Lamb Diseases Coincident with Louping-ill. STEWART, W. LYLE, and PONSFORD, A. PHYLLIS. (1937.) *J. Comp. Path. and Therap.* **50.** 4. 395-400.]

It has long been recognised that a serious mortality may be expected in the spring amongst the lambs on a tick-infested hill farm. On some farms it is known that this mortality is due mainly to infection with the virus of louping-ill, while on others the proportion of cases due to louping-ill is small and many lambs die from causes other than louping-ill infection.

The paper under review is of interest since the authors have endeavoured to determine the cause of death in all lambs which died in the spring on two tick-infested farms. Thus on the first farm it became obvious that the deaths were due to a variety of causes, the chief of which they attributed to a pyaemic condition caused by a Gram-positive micrococcus. On the second farm an attempt was made to establish the cause of death in 110 lamb carcases received during 15 days in May, 1937, and the following is an analysis of the diagnoses.

	Cases
Pyaemic infections alone	30
Cl. welchii, Type D infection alone ...	18
Pyaemic infections plus *Cl. welchii*, Type D infections	20
Lamb dysentery	5
Incidental deaths (known causes) ...	9
Suspected tick-borne fever	5
Indefinite	23
Total ...	110

The authors describe how McFadyean (1894) was the first to recognise that under the term "louping-ill" there was a group of morbid conditions which he classified as follows:—

(1) Pyaemic spinal meningitis, caused by pyogenic bacteria.

(2) Gastritis and enteritis from indigestible substances (wool, sand, dried grass) in the stomach or intestines.

(3) Disorders of brain functions, paralysis and general weakness, excess of cerebro-spinal fluid in the cranial cavity but without gross lesions in any of the organs of the body.

The authors conclude that the pyaemic condition encountered by them would be classified in McFadyean's group 1 with the exception that abscesses were found in various parts of the body besides the meninges. The various *welchii* infections of digestive origin would probably fall into McFadyean's group 2 and true louping-ill into McFadyean's group 3.

The farms on which the work was carried out do not appear to have been heavily infected with louping-ill since only a few cases of infection with the virus of louping-ill were observed on the first farm under examination.

[As a comment on this paper one might say that difficulty in diagnosing the presence of louping-ill infection on a farm is often experienced even when using a biological test in mice accompanied by histological examination of material from the central nervous system of affected animals. Although the authors do not appear to have made extensive use of these methods their work emphasises the serious mortality which occurs amongst lambs on tick-infested farms and they have focused attention on the possible cause of death in many cases.]

W. S. G.

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[Heartwater. Jones, Captain F. F. (1936.) *Annual Report of Vety. Dept., Northern Rhodesia.* pp. 71-76.]

The author, in view of the gravity of the disease (heartwater) in Northern Rhodesia, describes it at some length, dealing with the occurrence, symptoms, diagnosis, treatments which have been attempted and prophylaxis. As a result of this work the author has arrived at the following conclusions.

1. Heartwater must be regarded as a very serious disease and one of the worst with which the Veterinary Officer in Northern Rhodesia has to contend.

2. There are at least two forms of the disease—acute and sub-acute.

3. In many instances differential diagnosis is very difficult and can only be definitely determined by microscopical examination of Intima smears properly stained.

4. Arsenical poisoning may easily be confused with heartwater.

5. At least 90 per cent. of alleged outbreaks of Veld poisoning are actually due to heartwater.

6. Leishman staining is recommended for Intima smears.

7. The curative value of certain drugs used in the treatment of this disease is questionable, and further experimentation is necessary with a view to the discovery of a specific remedy.

8. Prophylactic short-interval dipping is advised as the only present known method of controlling and combatting the disease. The longest interval between dipping to be efficacious is five days. Neither seven- nor fourteen-day interval-dipping will prevent the appearance of heartwater.

9. Regular dipping, at five-day intervals, from October to March, is advocated.

10. Judicious and controlled grass-burning is suggested as an aid to the prevention of the breeding of the Bont tick, which carries the disease.

W. S. G.

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[Treatment of Brucella abortus Infection with Fouadin and Prontosil. Thomson, A. P. (1938.) *Brit. Med. J.*, October 29th, 1938. 884-885.]

Five cases of *Br. abortus* infection in man are reported. One case was treated with fouadin and four with prontosil album. All patients showed high agglutination titres in their blood before treatment. The titre fell after treatment with prontosil and all patients apparently showed some benefit. The author comments that "the cases here recorded support the general impression that in the treatment of this disease both prontosil album and fouadin are of value, and that the former may prove to be a simple specific remedy when the patient can tolerate it in moderate doses (about three grammes daily) for a week."

[Fouadin is a Bayer preparation containing a detoxicated complex salt of trivalent antimony and pyrocatechin.]

N. J. S.

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[The Nomenclature of the Scrotal Layers—A Plea for Uniformity. Zietzschmann, O. (1938.) *Arch. Tierheilk.* **73.** 4. 253-265. Four diagrams.]

The anatomy of the inguinal region is in itself sufficiently complicated without adding to its difficulties by introducing the question of nomenclature.

Zietzschmann suggests that all non-peritoneal layers be named according either to the structures from which they are derived, or to those with which they are anatomically associated. All peritoneal layers should be named

as are similar peritoneal reflections in the abdominal cavity; so that such expressions as tunica vaginalis communis and propria should be avoided, and instead all the peritoneal reflections covering the spermatic cord and testicle might be called the tunica vaginalis. The various folds which help to form this tunic could then be called according to the area in which they are situated. In its course from the abdomen to the scrotum, the testicle comes into contact with various portions of the abdominal muscles and their fasciae, but does not so form a canal in the accepted sense of the word. The term inguinal canal might therefore be replaced by an expression such as inguinal passage.

From the surgical point of view it is important to realise that only two layers can be recognised during castration: (1) The skin to which is attached the dartos and other muscular fasciae; (2) the peritoneal reflections with their covering of fasciae.

The main point about the so-called "covered operation" for castration is not so much whether the testicle is covered as whether the peritoneal coverings of the spermatic cord remain intact.

C. W. O.

REVIEW

[Manual for Comparative Anatomy. By Leonard P. Sayles, Assistant Professor of Biology, College of the City of New York. Pp. 214. 55 figures. 7s. 6d. net. Macmillan and Co., Ltd., London, 1938.]

This book is essentially a compilation of facts and questions concerning certain vertebrate types studied in the Biology Department of the College of the City of New York. The general scheme of the book is well conceived but it is only suitable for reading when examining or dissecting the specimens. It is conveniently divided into nine chapters which deal with: "Chordate Types; Integumentary System; Skeletal System; Muscular System; Digestive and Respiratory Systems; Circulatory System; Urogenital System; Sense Organs and Nervous System."

The work is too tabular in its arrangement to be called comparative and little attempt is made to draw the student's attention to the relationships of the types described. The diagrams are somewhat sketchy and it is felt that a few additional and more elaborate drawings would have improved this manual.

The field of study covered by this book is more suitable for students of Zoology than for students of Veterinary Science.

REPORT

[Proceedings under the Diseases of Animals Acts. Report for the Year 1937. Issued by the Ministry of Agriculture and Fisheries.]

Part I of the Report contains an account of Part IV of the Agriculture Act of 1937 and its effect—the steps taken to provide for the establishment of the Centralised State Veterinary Service, which marks the opening of a new era in the history of official administration, and veterinary work under the Diseases of Animals Acts in Great Britain. The Report states that Part IV of the Agriculture Act is principally provided for the purpose of disease eradication, but this Act gave additional powers for the establishment of a State Veterinary Service under the central control of the Ministry of Agriculture, this involving the transfer from local authorities to the Ministry of the functions of veterinary inspectors in England and veterinary officers in Scotland under the Diseases of Animals Acts and any enactments relating to milk or to dairies, previously performed by the veterinary inspectors of local authorities.

The veterinary functions transferred from local authorities to the Ministry by Section 19 of the Act of 1937 may be defined more precisely as follows:—

(i) Diagnostic inquiries into any of the diseases of animals notifiable under the diseases of Animals Acts. This also involved the transfer to the Ministry of those functions under the Tuberculosis Order which relate to the slaughter of affected cattle and the payment of compensation to owners.

(ii) The veterinary inspection of animals at markets when and where required.

(iii) Routine veterinary inspection of dairy herds.

(iv) Examination of cattle by a veterinary inspector on receipt of a notification from a medical officer of health that milk from a particular herd has been found infected with tubercle bacilli, or that an infectious disease is caused or likely to be caused by the consumption of milk from the herd.

(v) Tuberculin testing and inspection of cattle for the purpose of the Milk (Special Designations) Orders. (This does not affect the existing powers of local authorities to grant licences authorising the use of the designations "tuberculin tested" and "accredited" in England and Wales and "certified," "tuberculin tested" and "standard" in Scotland.)

The Report describes the organisation of the State Veterinary Service. Great Britain has been divided into 78 Divisions, each in charge of a Divisional Inspector. The Divisions are grouped into 22 Areas, each Area being in charge of a Superintending Inspector.

Part II of the Report deals with the incidence of the more prevalent contagious animal diseases in Great Britain in 1937.

FOOT-AND-MOUTH DISEASE.—The character and history of foot-and-mouth disease in Great Britain are dealt with and a description is given of the policy and procedure adopted for its eradication. In 1871, 52,000 outbreaks were officially reported. From 1880-84, 27,445 outbreaks, involving some 800,000 affected animals, are recorded.

The disease was made notifiable in 1869 and the slaughter policy introduced in 1892.

In giving an account of the disease during 1937, the Report also includes the period up to March 9th, 1938. During the first nine months of the year the country was comparatively free from the disease. From October, 1937, to March, 1938, 268 outbreaks were confirmed.

BOVINE TUBERCULOSIS.—Under the Tuberculosis Order (1925) 22,425 cattle were slaughtered during the year, this being the largest number recorded in any one year since the Order was introduced. The compensation paid to owners of slaughtered cattle amounted to £106,477, averaging £4 15s. per head.

The Tuberculosis (Attested Herds) Scheme.—At the end of the year there were 813 herds, comprising approximately 37,000 cattle, on the Register of Attested Herds.

SHEEP SCAB.—The Report gives information respecting sheep scab, of which there were 253 outbreaks during the year: 147 in England, 70 in Wales and 36 in Scotland.

SWINE FEVER.—In the case of swine fever, there were 982 outbreaks confirmed, which is a decrease of 47·6 per cent. compared with the previous year.

ANTHRAX.—Seven hundred and forty-three cases of anthrax were confirmed, being an increase of 275, or 58·8 per cent., over the previous year.

Part III of the Report deals with poultry diseases and mentions the steps taken by the Ministry for the prevention and spread of disease amongst poultry.

Part IV describes the various methods adopted for the prevention of disease relating to imported animals. Under this heading 75 cases of sheep scab were reported and two cases of rabies in dogs whilst undergoing the prescribed period of quarantine, one dog being from East Africa and the other from India.

Part V of the Report deals with the protection of animals and poultry Orders, and the exportation of horses.

In Part VI, information is given describing the conditions for the export of pedigree livestock, raw animal products, fertilisers, etc. It is seen that during the year 254 cattle, 450 sheep and 55 pigs were exported.

Part VII deals with the work carried out under the Directorship of Dr. W. H. Andrews at the Laboratory, Weybridge.

The Report is completed by statistics relating to diseases amongst animals in Great Britain and the number of animals imported and exported.

N.V.M.A. DIVISIONAL REPORT

Southern Counties Veterinary Society*

VISIT TO HAMPSHIRE C.C. FARM INSTITUTE

Members of the Southern Counties Veterinary Society spent an enjoyable and instructive half-day at the Hampshire County Council's Farm Institute, Sparsholt, Winchester, on Friday, October 21st, 1938.

Following lunch, the members were shown over the poultry section of the Institute, where, among the birds being kept under ideal conditions, they were able to see some fine turkeys being fattened for Christmas.

A short business meeting was then held, at which Mr. G. W. Begg presided in the absence of the President (Mr. F. Beckett). The following members attended: Messrs. G. W. Begg, J. B. White, N. S. Barron, A. E. Roberts and A. D. Campbell, and the Hon. Secretary; the visitors included Messrs. W. P. Blount, D. K. Hunt, and the poultry instructors and poultry students at the Farm Institute.

The Chairman remarked on the small attendance, and said it was remarkable how few people there were present from the immediate vicinity of Winchester—most of those present had come from a good distance.

The Hon. Secretary (Mr. H. S. Caldwell) said the minutes of the last meeting had appeared in the *Veterinary Record*: they were taken as read.

The Secretary said he had received a message from Mr. Beckett, their President, regretting his inability to attend: he was unable to get there at the last moment. Accordingly he proposed that Mr. Begg should take the chair, to which the meeting agreed.

Apologies for absence were read from Sir Frederick Hobday, Dr. Bullock, Messrs. Henry Gray, Esmond Brown, J. H. Ripley, J. S. Wood, J. F. D. Tutt, W. F. Maynard, H. C. Rockett, Majors Wallace, Howard and Davenport.

On the proposition of the CHAIRMAN, seconded by Mr. J. B. WHITE, Mr. A. D. Campbell was elected a member of the Society.

The Hon. Secretary said he had received a letter from Major F. J. Taylor, of Oxford, who

*Received for publication December 6th, 1938.

had been a member of the Society for a great many years, and who wished to resign.

The resignation was accepted with regret.

Mr. Caldwell also reported the receipt of a letter from Mr. Bernard Gorton, of Bournemouth, tendering his resignation. He had asked Mr. Gorton to reconsider his resignation, but, in reply, Mr. Gorton had intimated that he could not see his way to do so.

This resignation, also, was accepted with regret.

The meeting then went into committee to consider a certain report which had appeared in a newspaper, and it was agreed to make further inquiries into the matter.

Arrangements for the next meeting were left in the hands of the Hon. Secretary.

The Hon. Secretary raised the question of writing a circular letter to all professional colleagues in the division, because about half of them were not members of the Society. Personally he thought the entrance fee was somewhat of a stumbling block because they had a number of people in the district who were only there for a short time, and it seemed rather much to ask them to pay an entrance fee if they were only resident there a year or two.

The Chairman suggested that was a matter which might come up at the annual meeting.

Mr. White (the Hon. Treasurer) said the entrance fee did not make a lot of difference to the finances, though it was always a struggle for the Society to keep its head above water. He was quite willing that the entrance fee should be dropped.

It was decided that the question should be put on the agenda for the next meeting in order that a recommendation could be made to go forward to the annual general meeting in March.

Demonstration: Poultry Post-mortem Technique

After the business, Mr. W. P. Blount, Chief Veterinary Officer, East Sussex County Council, gave a demonstration of poultry *post-mortem* technique.

Mr. Blount, with the aid of a blackboard and easel, to which he nailed his specimen birds, demonstrated one of the most advantageous methods for carry out a *post-mortem* examination. Besides the members of the Society who witnessed the demonstration, students at the Farm Institute were present and were keenly interested.

Mr. Blount, explaining that the demonstration would be informal, invited those present to interrupt him at any stage and ask questions. He was taken at his word, and many interesting and varied questions were asked him while the *post-mortem* examinations were actually being carried out.

The demonstrator said there were a number of methods of carrying out a *post-mortem* examination, and any number of tools could be used, but he usually preferred to use only two —a stout pair of scissors and one pair of forceps. If they visited a farm to carry out a *post-mortem* examination, the fewer tools they had the better, because the fewer they had to leave behind. (Laughter.) From a practical point of view, 85 to 90 per cent. of the cases were diagnosed by an examination of the internal organs, and very few were diagnosed externally.

Mr. Blount then cut open a bird, and explained the various reasons for carrying out certain operations, and what to look for in the birds.

He also demonstrated the brain-sticking method of killing birds—by penetration of the medulla and associated parts with a needle through the foramen magnum. This was stated to be particularly valuable in cases where it was advisable to retain the major portion of the blood *in situ*. (Normally, when the neck is pulled, a considerable quantity of blood drains away from the internal organs and therefore the appearance of the liver, etc., is abnormal.)

In all, Mr. Blount carried out *post-mortem* examinations on three birds.

Afterwards, a number of questions were asked, and a number of preserved specimens showing the effects of various diseases on the organs of the body were on view, and explained.

During tea the members voted a very hearty expression of thanks to Mr. Blount for coming down from Lewes to give his demonstration, which was very instructive and shown in a most interesting manner. Similar tributes were paid to Mr. R. H. Smith, B.Sc., Principal, for his kindness in placing the resources of the Farm Institute at the disposal of the Society, and to the poultry instructors for their attention and explanations of the many and varied questions raised regarding the poultry farm.

H. S. Caldwell, *Hon. Secretary.*

The tenth annual Congress of Military Medicine and Pharmacy is to be held at Washington, U.S.A., from May 7th to 15th, 1939. The countries participating include Argentina, Belgium, Brazil, Czechoslovakia, Germany, Great Britain, Italy, Mexico, and the United States of America. Among the questions to be discussed are the following: The organisation and function of the medical services in colonial expeditions; probable casualties in war and methods of calculation; practical procedures for anaesthesia and analgesia in war surgery; organisation and function of the military chemico-pharmaceutical service; emergency treatment and primary apparatus for fractures of the jaws in war; technical specialisation of administrative officers in the medical service; oxygen therapy and its practical use with troops on active service.

ROYAL COLLEGE OF VETERINARY SURGEONS

Membership Examination

LIST OF SUCCESSFUL CANDIDATES

(*Continued from page* 1749.)

Edinburgh

FIRST YEAR:

Anderson, G. W.	Lowes, Emerson
Barrow, D. B. V.	Macdonald, Angus (C)
Conn, W. B.	McKee, F. A.
Cosgrove, J. P.	Mann, R. V. B.
Coveney, P. V.	Marshall, W. S.
Crozier, T. G.	Parameswaran-Nair, K.
Henderson, N. J. D.	Philp, J. M.
Holmes, D. S.	Tallantire, I. W.
Jones, A. R. L.	White, G. J.

(C) Denotes credit in Chemistry.

SECOND YEAR:

Black, N. M.	Mackintosh, A. S.
Brydon, D. A. D.	Maclean, Roderick
Chisholm, L. P. S.	Mitchinson, G. C.
Dunn, C. W.	Morton, P. E.
Grant, J. G. D.	Simon, R. F. (P)
Greenwell, G. E.	Smith, D. C.
Hagri, M. A. E. A. (P)	Taylor, J. L.
Houston, T. H.	Trombetti, G. A. G.
Longley, R. F. A. L.	Warren-Smith, L. (P)
Macdonald, D. M.	

(P) Denotes credit in Physiology, etc.

FOURTH YEAR:

Abbott, J. B.	McCrea, Robert
Beaumont, G. L.	Robertson, R. R.
Blackburn, P. S.	Shanks, Thomas
Blanshard, William	Taylor, Alex.
Britton, A. F. F.	Turner, J. R. (Paras)
Christie, G. J.	Twizell, C. W.
Douglas, J. F.	Watson, Robert
Forbes, F. W. N.	Wilson, J. G.
Jack, Alex.	Ziffo, G. S.

(Paras) Denotes credit in Parasitology.

Glasgow

FIRST YEAR:

Baxter, J. D.	Lall, D. S. P. C.
Bennie, G. A.	MacFarlane, D. L.
Calder, R. H.	Monie, K. R.
Crichton, J. A.	Morton, A.
Fergusson, T.	Nimmo, J. K.
Gaston, Miss D. A.	Paneth, Miss B. (C)
Gregor, Alec.	Pinkney, Miss J.
Howie, T. W. T.	

(C) Denotes credit in Chemistry.

SECOND YEAR: (See *V.R.* 50. 51. page 1749).

THIRD YEAR:

Bennie, W. E.	Hampstead, F. J.
Blair, J. W.	Hay, Thos.
Cairns, J. T.	Jarron, J. A. (P)
Clark, J. S.	MacLeod, F. P.
Ferguson, C. M.	Miller, Wm.
Findlay, J. W.	Monie, R. F.
Gray, P. M.	Moore, C. C. S. (A)

(P) Denotes credit in Pharmacology, etc.
(A) Denotes credit in Anatomy.

Morrison, A. M.	Scott, Alex.
Naismith, J. A.	Scott, W. A. C.
Pearson, D. J.	Thompson, J. J.
Rankin, J. D.	Wardrop, A. G.

FOURTH YEAR:

Bain, J. S.	Shaw, Alex.
Ferguson, A.	Smith, R. J.
Fraser, A. K.	Stevenson, Miss M. C.
Macrae, R. R.	Tulloch, J. I.
Munro, D. J.	Watt, James
Parker, Miss E. R.	Weir, Miss M. B.
(Paras)	Wight, J. A.

(Paras) Denotes credit in Parasitology.

FIFTH YEAR:

Angus, D. B.	MacKinnon, William
Hepburn, J. R. B.	Turner, H. F.
Macdonald, John	Wyse, George

CLASS D:

Scott, D. C.

Liverpool

SECOND YEAR:

Bee, B. R.	McNaught, T. T.
Davison, F. L.	Protheroe, S.
Edwards, D. B.	Tarver, W. J.
*Henderson, W.	Wilding, M. E.
Hughes, H.	

* Denotes second class honours.

THIRD YEAR:

Davies, D. B.	Jones, H. E. W.
Dinsdale, N.	Lewis, P. D.
Donnelly, J. F. (A)	Pettett, D. W. S. (A)
Edwards, C. M.	Turnbull, P.
Greer, F. G.	

(A) Denotes credit in Anatomy.

FOURTH YEAR:

Carr, W. H.	Johnston, R. W.
Craig, N.	Ormrod, A. N.
Firth, T. B.	Willis, G. A.
Hornby, R. B.	

FIFTH YEAR:

Cassar, A. J.	Harshaw, J. W.
France, W. H.	Williams, R. E.

CLASS D:

Chappel, C. N.	Stubbs, Miss P.
Ryan, J. F.	

(*To be concluded.*)

A request from the National Poultry Council and the N.F.U. for a cash grant from the Treasury towards the expenses of staging a national exhibit at the World's Poultry Congress next year has been declined. As the poultry industry is not in a position to bear the entire cost, it is feared that in the absence of State support the idea of a national exhibit representing the British poultry industry will be abandoned. When the Congress was held in Leipzig in 1936 the Treasury made a grant of £350, and for the Rome Congress in 1933 no monetary grant was made, but clerical and organising assistance was provided by the Ministry of Agriculture.

In Parliament

The following are among the questions and answers recorded in the House of Commons recently:—

Agricultural Research (Expenditure)

Mr. Ridley asked the Minister of Agriculture the total amount of money expended by his department for research purposes for the last financial year and the directions in which the money was expended?

Mr. W. S. Morrison: As the reply contains a table of figures, I propose, with the hon. Member's permission, to circulate it in the Official Report.

Following is the reply:—

Statement showing expenditure on research (excluding administrative expenses and overhead charges) charged to the Ministry's Vote during the financial year, 1937-38.

	1937-38. £
Agricultural Research.	
1. Grants to Research Institutes for research mainly of a fundamental and continuous character, but including also specific schemes	195,076
2. Grants to Colleges, Institutions, etc., for local researches and specialist advisory work	117,504 (*a*)
3. Foot and Mouth Disease Research Committee. Researches conducted by the Ministry	16,404
4. Animal and Plant Pathology	8,330 (*b*)
5. Scholarships, Studentships and Fellowships	3,878
6. Contributions to Imperial Agricultural Bureaux, Imperial Institute of Entomology, etc....	613
Fishery Research.	
7. Grants to Colleges and Institutions, maintenance of research vessels, shellfish research, etc.*	28,685
	£370,490

*Includes salaries and travelling expenses of Ministry's Scientific Staff.

(*a*) Includes £2,400 recovered from the Land Fertility Research Fund, £1,569 from the Milk Marketing Board, and £260 from the Racecourse Betting Control Board.

(*b*) Includes £755 recovered from the Milk Marketing Board.

. . . . .

Performing Animals (Quarantine Regulations)

Mr. Messer asked the Minister of Agriculture whether he will make some alteration in the present quarantine regulations under which performing animals are allowed to escape quarantine if they are carried from place to place in nose and paw-proof containers, a method which involves cruelty to the animals?

Mr. W. S. Morrison: As indicated in my reply to the hon. Member's question on June 23rd last, the existing quarantine regulations require the effective isolation of imported performing dogs for six months after importation on premises approved by my department. The provision under which the animals are permitted to be moved from one place of performance to another during the quarantine period, if conveyed in receptacles so constructed as to prevent contact with other animals, does not involve cruelty, and in the circumstances no alteration of the regulations is necessary.

Mr. Messer: Can the right hon. Gentleman say whether the containers are made in accordance with the size of the animal?

Mr. Morrison: Yes, Sir; they have to be suitable for the animals concerned. I can assure the hon. Member that no charge has been recorded in connection with this matter during the past five years.

Colonel Sir Charles MacAndrew: Can my right hon. Friend say what inspection there is of these containers in order to prevent animals from getting out?

Mr. Morrison: The whole matter is kept under supervision. If my hon. and gallant Friend has any information of that character, I should be very glad to examine it, because it is vitally important that the regulations for preventing rabies infection in this country should be most strictly observed.

Sir C. MacAndrew: I meant animals actually escaping from their cages—lions and so on.

. . . . .

Tetanus (Experiments on Animals)

Mr. Groves asked the Home Secretary whether each bleeding of each horse in the preparation of the new preventive treatment for tetanus in the Army is recorded as a separate experiment in the Annual Return of Experiments on Living Animals?

Mr. Lloyd: I am informed that the new preventive treatment for tetanus now adopted in the Army does not involve the bleeding of horses.

. . . . .

Milk

Sir E. Graham-Little asked the Minister of Health whether he is aware that many instances have recently occurred when cows that are reactors to the tuberculin test, after being weeded out from a tuberculin-tested herd, have been retained by the same owner for the production of accredited and ordinary milk; and whether he intends to take action to give better protection to the public health in connection with such cases?

Mr. Elliot: Cows showing a reaction to the tuberculin test are not, on that account, slaughtered, since as the hon. Member is aware, reaction to the tuberculin test does not in itself imply infection in the milk of a reactor. The question of improving the standard of the milk supply of the country is receiving active attention on the part of His Majesty's Government.

Sir Francis Fremantle: Does not that show the absolute necessity for giving local authorities power to secure the pasteurisation of milk?

Mr. Leach: Has the right hon. Gentleman reached the conclusion that the tuberculin test for cattle is not reliable?

[No answer was given.]

. . . . .

Livestock (Thefts by Night)

Mr. J. Morgan asked the Home Secretary whether he is aware of the increasing losses sustained by farmers in various counties from after-dark thieves believed to be using motor vehicles; and whether he was prepared to recommend an experimental system of police licensing for the vehicular movement of farm livestock between sundown and sunrise.

Sir S. Hoare: I understand that the police have received a number of complaints of offences of this kind, but I do not know that the number shows any significant increase. The police are fully alive to the importance of co-operating to check this class of crime. They

(*Concluded at foot of column* 1, *page* 1786.)

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

A Merry Christmas to all our Readers

Diary of Events

Dec. 28th.—Meeting of West of Scotland Division, N.V.M.A., at George Hotel, Glasgow, 4.30 p.m.

1939

Jan. 2nd.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

Jan. 2nd.—N.V.M.A. Committee Meetings.

Jan. 3rd.—N.V.M.A. Committee Meetings and Council Meeting.

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THE LOVEDAY REPORT

At a recent meeting of the Midland Counties Division, N.V.M.A., the following resolution, relative to the above Report, was passed *nem. con.*:—

"That this meeting of the Midland Counties Veterinary Medical Association held on December 16th, 1938, wishes to place on record its general approval of the salient recommendations of the Loveday Report. These recommendations are considered to be in the best interests of all sections of the profession and should do much to ensure and secure its continued advancement."

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already have certain powers to inspect vehicles carrying livestock, and it appears unlikely that a system of police licensing of movement of livestock by night would be a practicable solution of the problem or acceptable to farmers.

Mr. Morgan: Then is the right hon. Gentleman not aware that there have been 15 such cases in the county of Northampton alone in recent weeks and that no proceedings have been taken in any case?

Sir S. Hoare: I am not aware of the actual number of cases in the county of Northampton. The figures, however, go to show that there has been no significant increase of this kind for the whole country.

Mr. Morgan: Will the right hon. Gentleman make inquiries into the case of Northamptonshire, as to whether or not it represents a marked increase in that area?

[No answer was given.]

PERSONAL

Illness of Sir Frederick Hobday

We learn with the deepest regret that Sir Frederick Hobday, C.M.G., F.R.C.V.S., Past Principal and Dean of the Royal Veterinary College, is lying seriously ill at his home, 31, Argyll Road, Kensington. Sir Frederick, who is suffering from a painful rheumatic disorder affecting the spine, is, our readers are specially requested to note, unable to receive visitors. Inability to rest has told upon his strength considerably, but we are glad to say, as is gathered from latest advices, that he is now sleeping better.

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R.C.V.S. OBITUARY

Bell, James George, 1, Lismore Place, Carlisle, Cumberland. Graduated N. Edinburgh, April 13th, 1882. Died December 16th, 1938; aged 78 years.

Mr. Bell was one of the best known veterinary surgeons in Cumberland and Westmorland, the northern counties and the Border. He was born in the district and educated at Aspatria College, Blencowe Grammar School. Associated with practically all the hunts in the district, he regularly rode to hounds up till about a year ago. He was keenly interested in light horses and was at one time a member of the council of the Cumberland Agricultural Society.

Carter, Arthur, Orchard House, Haunton, Tamworth, Staffs. Captain late R.A.V.C. Graduated London, July 5th, 1916. Died December 9th, 1938.

Dykes, J. Rowland, Hemelstone, Wellingborough, Northants. Graduated Edinburgh, April 19th, 1883. Died December 15th, 1938; aged 79 years.

Mr. Dykes, who passed away in a nursing home at Luton, where he had been a patient for some weeks, was born in Wellingborough, being the only son of the late Mr. John Dykes, farmer, of "The Maylands," Buckwell End. After his education at the old Grammar School he was articled to Messrs. Sharman, Jackson and Archer, the Wellingborough solicitors, but finding that an indoor life did not suit his health, he obtained a post as estate agent to the late Lord Spencer.

After qualifying, he became assistant to the late Mr. Taylor at Market Harborough. Two years later he obtained an inspectorship under the Board of Agriculture and Fisheries; in addition he held the office of local inspector under the Northants County Council. These appointments he retained until his retirement twelve years ago, when, because of ill-health, he disposed of his practice, which was taken over by Lieut.-Colonel E. W. Parks, M.R.C.V.S., who is still in Wellingborough.

Many times Mr. Dykes was asked to stand for membership of the Wellingborough Urban Council, but on each occasion declined to allow his name to go forward.

Mr. Dykes leaves a widow and one son, Mr. Leslie T. R. Dykes, who is in business in Wellingborough.

Sommerville, James, Rowallandale, Clarkston, Glasgow. Captain late R.A.V.C. Graduated Glasgow, May 20th, 1909. Died December 15th, 1938; aged 59 years.

Mr. James Sommerville, who was known throughout Scotland as an authority in many

branches of his profession, died at his home, 1, Stamperland Crescent, Clarkston, near Glasgow.

He had been in practice in Clarkston since 1920, returning to his native Glasgow after three-and-a-half years' war service in France with the Royal Army Veterinary Corps, in which he attained the rank of captain.

Before the war he was in the Veterinary Department of Edinburgh Corporation.

Mr. Sommerville had for some years been veterinary surgeon to the Scottish Kennel Club for its Glasgow shows, and he also had an appointment as official veterinary surgeon to the White City greyhound racing track.

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UNIVERSITY OF LIVERPOOL EXAMINATION LIST

Following is the December, 1938, Examination List of the University of Liverpool School of Veterinary Science.

DEGREE OF B.V.Sc.

SECOND EXAMINATION: Bee, B. R., Clay, H. A., Foster, J. L., Gibson, T. E. (3), Jones, D. K., McLaren, I. S., Mahmoud, A. H., Pickin, W., Shaw, I. G., Stabler, A. B. O., Wilson, A. A.

THIRD EXAMINATION: *Part I.*—Clarke, R., Donnelly, J. F. (2), Dye, R. W. (2), Scott, Mary F.; *Part II.*—Donnelly, J. F.; *Part III.*—Clarke, R., Scott, Mary F.

FOURTH EXAMINATION: Hornby, R. B. (1).

FINAL EXAMINATION: *Part I.*—Dransfield, J. W., Hancock, J. L., Wood, R. B.; *Part II.*—Dransfield, J. W., Hancock, J. L., Wood, R. B.

(1) Distinction in Veterinary Parasitology and Entomology.

(2) Distinction in Veterinary Anatomy.

(3) Physiology (including Histology) and Bio-chemistry.

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DUNLOP INVENTION CELEBRATION DINNER

Over 800 people were present on the evening of December 16th at a dinner given by the Dunlop Rubber Company (London region) in celebration of the jubilee of the invention of the pneumatic tyre by Mr. John Boyd Dunlop, M.R.C.V.S., tribute to whose inventive genius already has been paid in our columns. Mr. Edwin F. Mitchell presided.

Mr. Herbert Morrison, M.P., proposed the toast "Jubilee." He said that life was pleasant and easy-going before the petrol engine and the pneumatic tyre turned our roads into speed tracks and our world into a parish of bickering neighbours. Thanks to the pneumatic tyre, among other things, Prime Ministers could slip into an air liner and in an hour or two, for good or ill, come face to face with the heads of neighbouring countries. They could speak out; they could clear the air. But the same machines which could be used on missions of reason and good will were also painfully tempting to the old Adam waiting behind the scenes. He wondered how it was that every generation could produce men gifted with the genius of invention, yet, in the arts of government, the same old prejudices were good enough. It was an irony that man, so skilled in learning, should be so stupid in living.

It was an odd world, this community on tyres. It would settle down, but only with a deal more hard thinking. Only when they brought to major social problems the patience and concern for accuracy, the willingness to experiment that moved the inventor, would they make a world safe to be born in.

Captain G. E. T. Eyston, supporting the toast, said his own experience of Dunlop products was 500,000 miles on the road and 150,000 miles at over 100 miles an hour when racing. It was a marvellous achievement that the same section tyres had been used from the time when the land speed record was 200 miles to the present time when it was 360 miles an hour.

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COLONIAL VETERINARY SCHOLARSHIPS

The following candidates have been selected for Colonial Veterinary Scholarships during 1938. Subject to vacancies being available holders of these scholarships are normally offered appointments in the Colonial Service after completing their course of training satisfactorily: Barnett, S. F., Royal Veterinary College, Camden Town, N.W.1; Hutchinson, R. A., Durham; Kendall, S. B., Imperial College of Science, London; Stones, L. C., Oxford; Westcott, E. J., Imperial College of Science, London.

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ENCOURAGEMENT OF LIGHT HORSE BREEDING

The Hunters' Improvement and National Light Horse Breeding Society announce that a grant of £12,000 has been authorised by the Racecourse Betting Control Board towards the encouragement of light horse breeding in 1939.

The Council of the Society have decided to offer, at its London Show on February 28th to March 2nd, 66 premiums each of the value of £150, also 16 special premiums each of the value of £50, making it possible for a stallion to win £200 in all.

The Council have also decided that foal fees of 10s. for each mare which foals in 1940 will be paid to the owners of premium-winning stallions. The reintroduction of foaling fees, in abeyance since the 1932 foaling season, will, it is felt, be welcomed by stallion owners.

The Council state that they have learnt with regret of the decision of the War Office to discontinue its grant in aid of light horse breeding.

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STUDY OF FOOD IN RELATION TO HEALTH AND DISEASE

The formation of a Nutrition Panel consisting of prominent food experts and scientists in every branch of research and industry is announced by the Food Group of the Society of Chemical Industry.

The panel, with Professor J. C. Drummond, Professor of Bio-chemistry at London University, as Chairman, and Mr. A. L. Bacharach as Hon. Secretary, has been formed for the study of food in relation to health and disease. Its scope will include the production, processing, and distribution of food for both human and animal consumption, and the manufacture and control of preparations for supplementing diets for medical use in the nutritional disorders.

Regular meetings of members are being arranged and subjects to be discussed will range from vitamins to food storage in national emergency, and animal nutrition.

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IMPERIAL BUREAU OF DAIRY SCIENCE

After agreement by all the authorities concerned the new Imperial Bureau of Dairy Science has now been established at Shinfield, near Reading. Professor H. D. Kay, director of the National Institute for Research in Dairying, has been appointed director of the bureau. Mr. W. G. Sutton, from Massey Agricultural College,

New Zealand, has been appointed deputy-director, and has now taken up his duties. The bureau is financed co-operatively by the Governments of the British Empire in the same way as the other Imperial agricultural bureaux.

The functions of the bureau are to index research work in dairy science, whether carried out in the Empire or elsewhere; to collect, abstract and collate information bearing on dairy science, and to distribute such information both by publication and by private communication to research workers, officials, and advisory officers throughout the Empire. In addition the bureau is charged with the duty of establishing and maintaining contact between research workers with common interests, promoting conferences of workers and visits to research centres, and in general encouraging the circulation of information, ideas, material, and personnel.

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BRANDING OF REACTORS

At a recent meeting of the Executive Council of the National Federation of Meat Traders Associations, the following reply was "noted" to the resolution from the autumn meetings on the above subject which had been forwarded to the Ministry of Agriculture:—

"With reference to your letter of November 16th, in which you asked for the Minister's views on the resolution adopted by the annual conference of your Federation regarding the marketing of cattle which have reacted to the tuberculin test, Mr. Morrison desires me to say that, while the number of herds which are being subjected to the tuberculin test is increasing, such herds constitute a small proportion only of the cattle herds of the country.

"It would be inequitable to require owners who are endeavouring to establish tubercle-free herds to brand reactors eliminated from their herds, whilst cattle in other herds, which would react if tested, are free to be exposed for sale without any obligation as regards branding.

"In the case of herds from which tuberculosis is being eradicated under the Tuberculosis (Attested Herds) Scheme with a view to attestation, the regulations require the application of the tuberculin test at short intervals, thus ensuring the elimination of reactors at an early stage of the disease. No restrictions are placed upon the method of disposal of reacting cattle.

"With reference to the statement in your letter of October 20th, that the attitude of the Ministry in the past has been that reaction to the tuberculin test is not of itself evidence of the existence of tuberculosis, reaction to the test provides reliable information with regard to the presence of disease in an animal."

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CHRISTMAS GIFT FOR ARMY HORSES IN PALESTINE

By arrangement with the Veterinary Department of the War Office, the R.S.P.C.A. has sent a supply of veterinary requisites including light horse blankets, fly netting rugs, stable bandage sets and quantities of gauze muslin for the dressing of wounds on the legs to protect the wounds from irritation from flies, for the use of the Royal Army Veterinary Corps Mobile Veterinary Section in Palestine.

Thinking that the men of the Royal Army Veterinary Corps would equally appreciate a Christmas gift, the staff of the R.S.P.C.A. have sent them a supply of cigarettes with this consignment of veterinary supplies.

During the Great War the R.S.P.C.A. was the only society permitted to raise and administer a fund for the sick and wounded horses of the British Armies. The Society collected over a quarter of a million pounds, established hospitals to accommodate over 13,000 horses and, during the period of the war, these hospitals dealt with 2,526,549 horses, mules, camels, etc.

The Society has been given an assurance by the War Office that, when conditions become less troubled in Palestine and the Cavalry Units there are withdrawn, the British Army horses will not be disposed of locally, as happened after the Great War, but those that are unfit or aged will be put down and the remainder repatriated.

The Animal Protection Society in Palestine has also not been forgotten—recently the Jaffa S.P.C.A.'s hospital was raided by brigands, four horses, two mules and an Alsatian, who were patients, being stolen, together with some money and humane killers. A groom and dresser were carried off to the hills and, as animal owners were becoming afraid to bring their animals to the hospital, the premises have been closed temporarily and a stable and courtyard rented in a safer place in Jaffa. From 40 to 60 cases are dealt with every morning at the free clinic. Immediately the R.S.P.C.A. in London heard of the unfortunate loss in Jaffa, £100 was telegraphed from the Empire and Foreign Fund which was specially founded to assist animal protection work abroad and out of which the cost of the veterinary supplies mentioned above has been met.

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Erratum.—In the letter entitled "Swallowing the Tongue," from Mr. W. A. Campbell, M.R.C.V.S., of Boroughbridge, published in our last issue (p. 1757), in the second paragraph *read* "tubed" *for* "tested" in the sentence: "Only last week I tested a promising young hurdler, quite sound in his wind, as a last resource."

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H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at the following addresses: London: Adastral House, Kingsway, W.C.2, and 28, Abingdon Street, S.W.1; Cardiff: 1, St. Andrew's Crescent; Manchester: York Street; Edinburgh: 120, George Street.

	Price net s.	d.	*Post free* s.	d.
HOUSE OF LORDS PAPERS AND BILLS:				
(17). Performing Animals (Regulation) Amendment (No. 2) Bill. (H. L.) ...	0	1	0	1½
WAR OFFICE:				
Animal Management, 1933. Amendments 2, November, 1938. (57-9999)	0	1	0	1½
STATUTORY RULES AND ORDERS, 1938:				
1435. Animal. Diseases of Animals. The Foot-and-Mouth Disease (Controlled Areas Restrictions) General Order, dated November 28th, 1938	0	3	0	3½

WEIL'S DISEASE (LEPTOSPIRAL JAUNDICE) IN FISH WORKERS

Professor L. S. P. Davidson, in his inaugural address at the 1938–39 session of the Pharmaceutical Society in Edinburgh, dealt with "Weil's Disease (Leptospiral Jaundice) in Fish Workers in Aberdeen." In describing briefly the symptoms of the disease, Professor Davidson pointed out (states the *Pharmaceutical Journal*), that a patient suffering from it would become suddenly and acutely ill, showing signs resembling influenza, with high temperature, general pain, vomiting, severe jaundice, kidney failure, and might speedily die. It was so called because, in 1886, Weil described those symptoms and observed that the disease ran in epidemic form. A similar disease had been observed in South Africa, India, Holland, and Japan, where, in 1915, Inada and Ido first isolated and described the causal organism associated with the disease. The same symptoms occurred in epidemic form among the troops during the War and from the patients that particular organism was also isolated. In 1922 Professor Davidson came into direct contact with the disease in Edinburgh when a crop of cases were admitted to the Royal Infirmary from East Lothian. From these patients Dr. Buchanan successfully isolated spiral organisms similar to those described by other workers.

During the next few years Professor Schüffner, of Amsterdam, investigated the disease, and made the interesting observation that Weil's disease occurred near canals which were found to be infected by sewage. He also named the disease leptospiral jaundice, from the symptoms and the appearance of the causal organism (*Leptospira ictero-haemorrhagiae*). The organism resembled a wavy thread, and was characterised by having one end hooked. It was called the leptospira because of this hook, which made it turn in with a left rotatory motion. There were several varieties; for example, *Leptospira canicola,* which infected dogs.

Professor Davidson said that, in 1933, he found two patients in his wards with certain clinical manifestations, including fever and jaundice, which appeared similar to those that he had recently seen in Amsterdam in patients suffering from Weil's disease (spirochaetal jaundice). Dr. Smith, with whom he carried out the joint investigation, in making an examination, failed to discover any positive evidence of Weil's disease, but on sending a sample of the blood to Professor Schüffner at Amsterdam, he reported that it was positive. This apparent discrepancy arose from the fact that during the first seven days the organism could be isolated, but after that the immune bodies developed and the blood had to be subjected to a serological test. Those immune bodies might remain in the blood for a long period.

Prior to 1933 no case of Weil's disease had ever been proved to have occurred in Aberdeen. Professor Davidson then recounted the steps in the investigations he had carried out in conjunction with Dr. John Smith, bacteriologist to the City Hospital, Aberdeen, which enabled them to establish the existence of a new occupational disease they had found with the same type of spirochaetes, which they had been able to isolate from the blood and urine of patients suffering from Weil's disease. They proved that the connection between the carriers of the disease (the infected rats) and the human sufferers from the disease was the water and slime in the fish-curing establishments which had been contaminated by the excreta of the rodents. Lastly, the proof of the occupational nature of the disease was obtained by showing that practically all the patients worked in one area of the town near the Fish Market, and that 95 per cent. were engaged in the filleting, cleaning and distribution of fish. As a result, they supplied the local authorities with information in regard to the measures required for the prevention of the disease. The final step consisted of the preparation of serum for the treatment of Weil's disease, and of prophylaxis in the form of a campaign against rats and disinfection of premises. Chloros was found to kill the organisms and yet was not injurious to the fish. Rat-proofing of all establishments and extermination of the rats were, of course, obviously indicated.

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DUCTLESS GLANDS AND MILK SECRETION

The British Goat Society's Year Book contains the following article by Dr. S. J. Folley:—

"One of the most interesting achievements of modern physiology has been the discovery that certain glands, the so-called ductless or endocrine glands, are able to influence the growth and activities of other organs of the body by means of chemical substances, usually called hormones, which are carried by the blood stream from their places of manufacture (the endocrine glands) to all parts of the body. The ductless glands with which this article is concerned are (1) the ovary which adds to its well-known function of producing eggs from which the young develop after fertile mating, that of producing a hormone which causes oestrus or 'heat,' (2) the 'yellow body' which appears in the ovary for a short time after each period of 'heat' and which persists during pregnancy, (3) the thyroid which is situated near the windpipe in the neck, (4) the adrenals which lie above the kidneys, and finally (5) the pituitary which is underneath the brain and regulates the activity of the other ductless glands by means of its own hormones. Organic chemists have succeeded in finding out the chemical structure of the hormones manufactured by all of the aforementioned glands except the pituitary, and have even achieved the artificial production of some of them.

"Of all the endocrine glands in the animal body the above have been chosen for mention as being of special interest to those who are interested in milch goat husbandry, since recent scientific discoveries have indicated that the growth of the udder (mammary gland) and the secretion of milk are controlled by the hormones produced by these glands. We will now proceed to consider the present state of knowledge regarding these matters.

"*Growth of the Udder.*—Examination of the minute structure of the udder reveals the presence of a system of coalescing milk ducts which has its outlet at the teat. The udder of a virgin goat is relatively small and its duct system is less extensive than that of a goat in milk. The udder of the latter class of animal is further distinguished from that of the virgin by the presence of a large amount of secretory tissue made up of cells in which the milk is formed. Laboratory experiments have shown that the growth of the mammary duct system is due to the action of the 'heat' producing hormone of the ovary, while in many species of animals,

including probably the goat, the further growth of the milk-producing tissues which occurs during pregnancy is due to the combined action of this hormone and that produced by the 'yellow body.' If these two hormones are injected into virgin laboratory animals the mammary glands develop even if the ovaries have been removed. In all species of animals the male possesses a rudimentary mammary gland, the duct system of which normally never grows very much. It is a remarkable fact, however, that the mammary glands of male rats, guinea-pigs and rabbits have been experimentally caused to grow as large as those of pregnant females by injections of the two hormones we have been considering.

"*The Secretion of Milk.*—A third hormone is necessary to evoke the secretion of milk by the mature udder. This is a hormone called prolactin, produced by the pituitary gland, and it is called into action when the young are born, in a manner which has not yet been clearly made out. Constant production of prolactin by the pituitary seems to be essential for continued milk secretion, since the latter immediately ceases if the pituitary gland is removed. Though the chemical nature of prolactin has not yet been discovered, it is possible to make potent pituitary extracts containing prolactin which on injection into milking goats and cows will bring about considerable increases in milk yield. Unfortunately, such artificially produced increases are but temporary and it remains for future research to discover some means of prolonging the effects of the injections. When this has been accomplished and when, in addition, it has been discovered how to make prolactin itself or some equally effective substitute more cheaply than is possible as present, it should not be impossible by hormonal treatment to increase the milk production of goats and cows to a level unattainable to-day.

"Proper functioning of the thyroid gland is also necessary for normal milk secretion, since removal of the thyroid has an adverse effect on lactation, while conversely, administration of the thyroid hormone, thyroxine, either by feeding dried thyroid tissue or by injection of the artificially prepared hormone, not only temporarily increases the daily yield of milk but also the percentage of fat and non-fatty solids, particularly the former, in the milk. It may be concluded from such experiments that the fat content of milk under normal conditions depends to a large extent on the activity of the thyroid gland and that variations in thyroid activity between day and night may be responsible for the difference in the fat contents of morning and evening milk.

"An equal, if not more important, influence on milk secretion is exerted by the hormone produced by the outer or 'cortical' portion of the adrenal glands, removal of which from a lactating animal rapidly stops milk secretion. Indeed, the cessation of lactation which is the invariable sequel to operative removal of the pituitary from lactating animals may be said to be due to at least two distinct causes. The reason for this is that the adrenals only produce their hormone if the pituitary is functioning correctly, and therefore after the removal of the pituitary, the body not only lacks prolactin but the hormone of the cortical portion of the adrenals as well. Milk secretion cannot, therefore, be re-initiated after removal of the pituitary by injections of prolactin alone; the adrenal cortical hormone must be injected also.

"To sum up it may be said that the growth of the udder and the production of milk are dependent on the ductless glands considered above, the activities of which are co-ordinated by the hormone produced by the master gland, the pituitary. The latter, in addition, exerts a direct influence on lactation by means of the lactation hormone prolactin. In conclusion it should be emphasised that though scientific discoveries of recent years have added a great deal to our knowledge of the working of the udder, much remains to be further elucidated. We may, however, confidently expect that future research will provide results which will be of great benefit to the practical milk producer.

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THE BLOOD PLATELET

"It is over 30 years since Wright advanced the theory that the blood platelets are derived from the megakaryocytes, but recent reviews by A. Hittmair[1] and by L. M. Tocantins[2] indicate that, though this origin is accepted by the majority of haematologists, convincing evidence is still hard to find," states the *British Medical Journal* in a recent leading article. "The mechanism of the process is obscure, as the conditions in surviving preparations of marrow are abnormal, while megakaryocytes do not form platelets in tissue cultures. Some authors have postulated sudden explosive rupture of the megakaryocytes. More plausible theories are that fragmentation of the pseudopods produces platelets in the same way as the mammary epithelium degenerates into colostrum granules, or that the megakaryocytes exert a physicochemical influence on the neighbouring fluid in the same way as the fibrocytes lay down collagen fibres in the intercellular spaces. Megakaryocytes are present not only in the bone marrow but also in the spleen and the lungs, and it is conceivable that the lungs are an important site of platelet production. Much interest has recently been taken in a group of leukaemia-like conditions variously described as leuco-erythroblastic anaemia,[3] chronic non-leukaemic myelosis,[4] megakaryocytic myelosis with osteosclerosis,[5] and erythroleukaemia.[6] The common factor in these conditions is the presence of excessive numbers of megakaryocytes not only in the bone marrow but also in myeloid foci in the spleen, the liver, and the glands. The blood platelets are not increased in numbers—in fact there is a haemorrhagic tendency—there is no accumulation of megakaryocytes in the lungs, and the disorder progresses to fibrosis of the bone marrow, encroachment on the marrow cavity by cancellous tissue, and increased density of the cortex of the bones. The giant cells are identical with those normally present in the marrow, to which the function of platelet formation has been attributed, but the sequence of events gives little support to Wright's hypothesis.

"Whatever their origin, we must regard the platelets as a particulate secretion rather than as a cellular element of the blood. Not every particle in the blood stream is a platelet, and fragments of erythrocytes, leucocytes, fat droplets, parasites, and other structures have often been confused with them. This is one cause of the variety of views on their origin. Moreover, the platelets are very labile, and their apparent number, size, and shape may be greatly modified by technical errors. The average number of

platelets per cubic millimetre in heavy young adults is 250,000 in cutaneous blood, 300,000 in venous blood, and 350,000 in arterial blood. The very high normal values reported by some authors are the result of methods which break up the platelets, and figures above 500,000 are seldom, if ever, obtained in cutaneous blood in health. Platelets are often described as showing a dark central zone or chromomere and a clear peripheral zone or hyalomere, but this also is an artefact, for when platelets are rapidly fixed they present a diffuse and uniform granularity. Efforts to classify platelets by their size, shape, and staining reaction[7] are to be viewed with suspicion.

"The distribution of platelets through the circulating blood is irregular, and observers with the capillary microscope describe seeing schools of platelets, succeeded by periods when few or none are visible. When a vessel is injured platelets rapidly accumulate on the roughened surface and form the white thrombus from which the red thrombus grows down-stream. Agglutination of platelets and formation of thrombi can to a large extent be inhibited by the injection of heparin, which is now available in a form suitable for use in man.[8] Coagulation of blood may be initiated or proceed in the presence of few or no platelets, as in the coagulation of lymph, and agglutination of platelets may take place independently of coagulation. The correlation between simple numerical changes in the platelets and the rate of coagulation of the blood is in fact low. Nevertheless, it is generally agreed that the platelets play a part in initiating or accelerating the coagulation of blood. Only a small fraction of them are used up in the process, and the remainder play an even more important part in haemostasis by forming knots to which the fibrin filaments adhere. The clot then contracts, and the margins of the wound, which have already been brought into apposition by vascular constriction, are sealed together.

"In essential thrombocytopenia—the purpura haemorrhagica of Werlhof—there has long been controversy whether the low level of platelets is due to diminished production or increased destruction. The symptoms improve dramatically after splenectomy, but this may be equally well explained by assuming that the spleen inhibits the maturation of the platelets in the marrow or that it removes them from the circulation. If the work of Troland and Lee[9] is confirmed, there will be an end to this controversy. They were able to extract a substance from the spleens of patients with essential thrombocytopenia which reduced the platelet count by 90 per cent. when injected into animals. No such 'thrombocytopen' could be obtained from other tissues or from spleens removed for other diseases. The method employed for making the extracts was simple, and it is much to be hoped that others who have the opportunity to obtain material will speedily prove or disprove the claim. Experience has amply confirmed the suspicion that sedormid is a potent cause of purpura. A certain proportion of people either have or develop an idiosyncrasy to this drug, which manifests itself by an abrupt fall in the platelets and haemorrhagic purpura.[10] The symptoms may be exceedingly severe, and there is no reason to doubt that they may prove fatal. The choice of hypnotics is so wide that there would seem to be no reason for prescribing a drug which has this alarming potentiality, and practitioners in this country would be wise to follow the example of their American colleagues and exclude sedormid from the list of approved remedies."

References

[1] *Folia Haemat.*, Lpz. (1938.) **59.** 50.
[2] *Medicine.* (1938.) **17.** 155.
[3] *Edinb. med. J.* (1936.) **43.** 303.
[4] *Quart. J. Med.* (1937.) **31.** 253.
[5] *J. Path. Bact.* (1937.) **45.** 383.
[6] *Ibid.* (1938.) **47.** 327.
[7] *Folia Haemat.*, Lpz. (1937.) **58.** 363.
[8] *J. Physiol.* (1938.) **92.** 20.
[9] *Johns Hopk. Hosp. Bull.* (1938.) **62.** 85.
[10] *Lancet.* (1938.) **2.** 305.

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Correspondence between the National Pig Breeders' Association and the Ministry of Agriculture regarding the licensing of boars used for breeding purposes indicates that while the Government is not at present prepared to introduce legislation, it is willing to arrange a conference on the subject.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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THE LOVEDAY REPORT AND THE CAMBRIDGE VETERINARY SCHOOL

To the Editor of the Veterinary Record

Sir,—The scheme to establish a veterinary school at Cambridge has received the approval of the R.C.V.S. and it has the benediction of the Loveday Report.

This scheme will probably come to full fruition in the near future, whereas the extent to which the suggestions originated by the Committee on Veterinary Education in Great Britain will be carried into effect is very problematical. The significance of the part the proposed Cambridge school may play in the future work of the profession is therefore arresting.

The Loveday Report makes it clear that the Agricultural Research Council was the first to suggest the establishment of a veterinary school at Cambridge in order to provide men of high educational qualifications for research and public health administrative work. From this suggestion has arisen the scheme whereby a student who enters Cambridge after passing his first M.B. examination may take a Natural Science Tripos which will exempt him from the first, second and third examination of the R.C.V.S. Having taken this Honours degree at Cambridge he will proceed for the final two years of the veterinary curriculum to a school other than Cambridge. At the end of five years he should hold a degree from Cambridge and the M.R.C.V.S. diploma. So qualified he may now obtain by an additional one year's study at Cambridge a further diploma, the Cambridge diploma, in either anatomy, animal genetics, animal pathology, physiology, parasitology, biochemistry, pharmacology, or tropical veterinary medicine and there appears to be no reason why other subjects such as bacteriology should not be added to the list.

It should be remembered that the Cambridge school was suggested in order to create men of high qualifications for research and administrative work, and the Loveday Report in endorsing the scheme says, "*The proposals for the Diploma Course have, however, our thorough approval as being well designed to secure a body of recruits for the research side of veterinary work in one or other of the subjects for which that course would make provision.* Even if the holder of the Cambridge diploma does not enter on research his equipment for work as a veterinary practitioner or state veterinary officer cannot but be greatly improved."

No one will dispute the influence of Cambridge in the administrative and educational hierarchies of this country and the holders of the Cambridge degree and diploma seem destined to a material advantage when they compete for research or administrative appointments with their brethren possessing degrees or diplomas from London or provincial centres.

In this country there may be certain definite advantages in having veterinary research and senior administrative posts held by Cambridge graduates but if the small veterinary profession is to exert its fullest influence for public good by the prevention and elimination of disease in farm animals, it might be an advantage if the Cambridge graduates included those men of greatest ability in the profession. The students entering the Cambridge school will be few in numbers but relatively well-to-do; those entering the other veterinary schools will be greater in numbers but relatively poor. As a student's pocket bears no relationship to his ability it is more than probable that a considerably greater number of men of ability above the average will pass through the schools other than Cambridge. If these graduates had untrammelled access to the educational and social advantages the Cambridge diploma may confer, any fears that the Cambridge diploma might be a barrier to the entry of the ablest men into research and administrative posts would be allayed, but access for outsiders is to be difficult.

It is true that during the first five years, that is, before Cambridge graduates are available, candidates from other universities with Honours in science and possessing the M.R.C.V.S. diploma may be eligible for the Cambridge diploma and may take this after one year's study at Cambridge. After this, however, outside graduates of other universities who possess the M.R.C.V.S. or an equivalent diploma must spend two years on this same diploma course. If the Cambridge diploma is to be of outstanding educational value to veterinary science, it is deplorable that outside candidates of ability should be debarred from the benefits it gives, because a period of two years residence at Cambridge will be a most effective barrier to the taking of a one-year course.

As the proposals stand at present, a Cambridge University training in veterinary science will be the prerogative of the well-to-do. Higher education should be the privilege of the able and the smaller the profession the greater the need for this privilege to be exercised impartially.

Yours faithfully,

ALAN D. McEWEN.

Coldharbour,
Wye,
Ashford, Kent.

December 13th, 1938.

THE LOVEDAY REPORT

TO THE EDITOR OF THE VETERINARY RECORD

Sir,—I must confess I started to read the Loveday Report with a very open mind but after a study of its pages my final impression was that its findings were excellent.

In the first place, I was struck by the sympathy which a committee, largely composed of laymen, showed towards the veterinary profession and its problems.

The improvements suggested for the linking of our profession more closely with the universities and the granting of university degrees, to my mind cannot but be of the greatest advantage to our status especially when it is the unanimous opinion of the Committee that the one portal system should be retained.

One of the most valuable recommendations would appear to be the comprehensive scheme to improve the training in animal husbandry and preventive medicine—a recommendation which is very long overdue. The colleges would also be rebuilt where necessary and thoroughly equipped.

In these days of bureaucracy it is encouraging to read in the report the recognition of the essential place of the practitioner in the scheme and of the need for a closer liaison between the practitioner and the colleges, through their hospitals, of the staff of which he would become a honorary member. I feel sure that such a scheme would meet with the general approval of practitioners and also that the additional facilities available would raise the general standard of diagnosis and surgical technique.

The fact that the Loveday Report recommends a separate enquiry into unqualified practice would indicate that the Committee is fully alive to its dangers.

I have nothing but admiration for the past work of the R.C.V.S. and the colleges in the face of financial starvation. The Loveday Report now recommends Government aid on a generous and far-reaching scale. The Report doubtless has flaws which need revision: as its acceptance will largely depend on the unanimous approval of the profession it is sincerely to be hoped that these will be adjusted by universal agreement.

Yours faithfully,

O. V. GUNNING.

Tutbury,
Burton-on-Trent.

December 16th, 1938.

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TO THE EDITOR OF THE VETERINARY RECORD

Sir,—In my letter which has been published in the *Veterinary Record* dated December 17th, a whole line has been omitted by the printer in the third paragraph, with the result that the sentence concerned is not intelligible.

The sixth and following lines of this paragraph should read: "have passed two resolutions which are unfavourable towards the first of the above-named recommendations."

Yours faithfully,

F. WARE.

Well House,
Shawford,
Hants.

December 18th, 1938.